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USSR Report

CHEMISTRY

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ADSORPTION

UDC 66.094.373/660.084/66.097.38/088.8/

STUDY OF ADSORPTION DURING IMPREGNATION OF ALUMINA-SILICA CARRIERS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 58, No 7, Jul 85
(manuscript received 5 Mar 84) pp 1630-1634.

PETROV, B. A., GÁVRILENKO, I. B. and LOGINOVA, I. V.

[Abstract] A serious shortcoming in the preparation of oxidation catalysts (for sulfur dioxide oxidation, for example) by impregnating a carrier with V^{+5} and K^{+} ions is the lack of reliable data on the mechanism and adsorption kinetics of the active components and the effects of the quantity of adsorbed matter on the subsequent treatment and properties of the catalyst. An analysis of previously obtained and currently produced data indicate that the adsorption capacity of a carrier is a function of its method of preparation and preliminary treatment as well as the Al_2O_3 content. Minimum and maximum adsorption vary according to Al_2O_3 content and type of treatment. Catalysts having small amounts of adsorbed components may be prepared by pre-activation of Al-Si carrier, regardless of its Al_2O_3 content and pore characteristics. Figures 3; references 9 (Russian).
[351-12765]

ALKALOIDS

UDC 547.944/945

ALKALOIDS OF VEXIBIA PACHYCARPA COLLECTED IN TAJIKISTAN

Dushanbe DOKLADY AKADEMII NAUK TADZHIKSKOY SSR in Russian Vol 28, No 3,
Mar 85 (manuscript received 21 Nov 84) pp 161-164

SADYKOV, Yu. D., KHODZHIMATOV, M. and DEGTYAREV, V. A., Institute of
Chemistry imeni V. I. Nikitin, Tajik SSR Academy of Sciences

[Abstract] Studies were conducted on the isolation and analysis of
alkaloids of *Vexibia pachycarpa* collected in the Samarkand Oblast of
Tajikistan. The plant was found to contain 7 detectable alkaloids, of
which 3 could not be isolated because of low concentrations. The four
components isolated were pachycarpine, sophocarpine, matrine and cytisine.
Highest concentrations of the alkaloids were detected in the seeds (3.06%)
and leaves (1.93%). Figures 1; references 11 (Russian).
[370-12172]

BIOCHEMISTRY

UDC 547.655.6:542.978:542.943

POLYHYDROXYNAPHTHOQUINONES: NOVEL CLASS OF NATURAL ANTIOXIDANTS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 7, Jul 85 (manuscript received 15 Mar 84) pp 1471-1476

BOGUSLAVSKAYA, L. V., KHRAPOVA, N. G. and MAKSIMOV, O. B., Pacific Ocean Institute of Bioorganic Chemistry, Far Eastern Scientific Center, USSR Academy of Sciences, Vladivostok; Institute of Physical Chemistry, USSR Academy of Sciences, Moscow

[Abstract] A series of polyhydroxynaphthoquinones were tested for putative antioxidant properties in low-temperature (60°C) cumene oxidation. The kinetic data demonstrated that these spinochromes do function as natural antioxidants, and that their rate of interaction with the peroxy radical is comparable to, or actually exceeds, that of 2,6-di-tert-butyl-4-methylphenol. 2,3,5,7,8-Pentahydroxy-6-ethylnaphthalene-1,4-dione was the most efficient antioxidant of the compounds tested. Figures 2; references 11 (Russian).

[350-12172]

CATALYSIS

NEW MEMBRANE CATALYST

Moscow TEKHNIKA MOLODEZHI in Russian No 7, Jul 85 pp 44-46

[Article by Natalya Shapova: "The Master Key"]

[Text] Catalysis is a general name given by J. Berzelius, a famous Swedish chemist, to the phenomenon of changes in the rates of chemical reactions (to either side) in the presence of small amounts of a certain substance, a catalyst. A catalyst is capable of accelerating a reaction a million-fold coming out unscathed, remaining unchanged upon its completion.

Modern chemical industry cannot develop successfully without producing new catalysts. Catalytic processes are in the center of attention of scientists today. An important contribution to the development of catalysis was made by the works of teams of scientists of the Institute of Petrochemical Synthesis imeni A. V. Topchiyev (INKhS), Friendship of Peoples University imeni P. Lumumba as well as of the Institute of Metallurgy imeni A. A. Baykov of the USSR Academy of Sciences. They developed very promising processes of reagent transfer through the so-called membrane catalysts and, moreover, developed their original designs which do not have any analogs in world practice.

These studies were explained by the chairman of the Department of Physical and Colloidal Chemistry of the Friendship of Peoples University, the director of the catalysis research project of the INKhS of the USSR Academy of Sciences, Corresponding Member of the USSR Academy of Sciences Vladimir Mikhaylovich Gryaznov to Natalya Shapova, our correspondent.

In modern chemical and petrochemical processes, raw materials must be transformed only to one substance and it is impermissible to have by-products. However, even under identical conditions, several side reactions progress in the reaction vessel along with the main reaction. To suppress them means to reduce the expenditure of the raw material, to simplify the purification of the target product or omit it completely, i.e., make the production wasteless. In our days, these problems are solved with the aid of various catalysts. There are many of them today: supported catalysts (for example, granules of aluminum oxides covered with palladium), massive metallic catalysts in the form of a grid of various alloys, etc. In recent years, special attention has been given to the so-called membrane catalysts.

These catalysts have a long history. As early as the middle of 19th century, a British scientist, Thomas Graham, observed hydrogen penetrating through a palladium foil and conducted some catalytic processes on it. Later, scientists started using foil as a membrane catalyst and control with its aid processes occurring with absorption or separation of hydrogen. I have in mind basic catalytic processes of the modern chemical production: hydrogenization and dehydrogenization processes. In the former, the organic substance absorbs hydrogen (for example, this is used to obtain cyclopentene, a monomer for the production of synthetic rubber) from cyclopentadiene. Secondly, on the contrary, the atoms of hydrogen split from hydrocarbon molecules (an example of this reaction is the obtaining of pyrocatechin, an initial raw material for the production of a strong blood-restoring agent -- adrenaline).

As a rule, the above processes are carried out in the presence of either supported catalysts, or massive metallic catalysts. But what happens in this case? Let us examine, for an example, hydrogenation processes. The bulk of the substances which have to be obtained here are reagents used in the chemical or pharmaceutical industry and are products of incomplete hydrogenation, i.e., they are still capable of accepting some amount of hydrogen. However, with the above-mentioned catalysts, they are hydrogenated completely and transform into harmful admixtures which have to be removed. It is only a membrane catalyst that can stop such a process in time and control it. How can it do it?

At a certain temperature (it is different for each process), the selectivity of the action of a membrane catalyst increases sharply: it passes into the reaction zone exactly the amount of hydrogen necessary for incomplete hydrogenation of the substance. This catalyst is distinguished from other similar catalysts by its high selectivity.

"Red" -- "Green"

A membrane catalyst acts just as a lightsignal at a crossroads. With a "green light", hydrogen atoms pass through it into the reaction zone, and with a "red light", the catalyst does not pass them. Here, the temperature plays the role of a regulator. By maintaining it at a certain level, we ensure the necessary gas concentration on the surface of the catalyst.

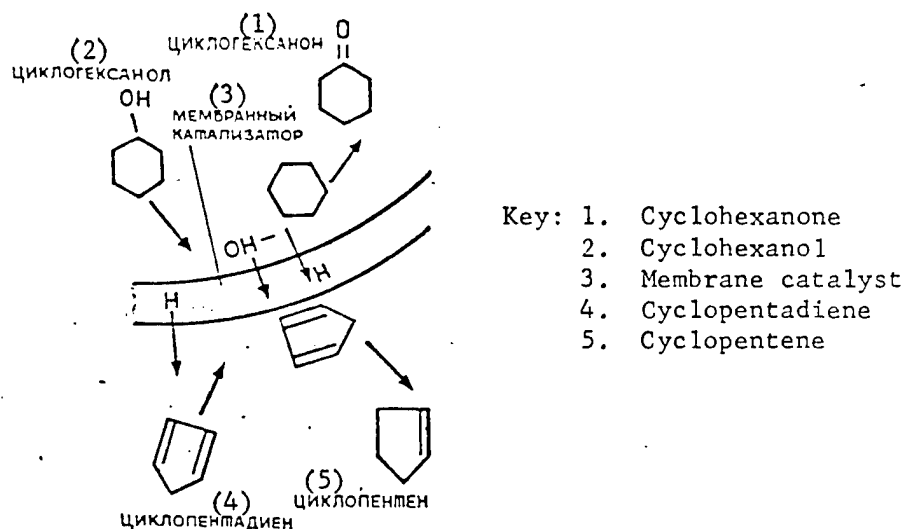
How does hydrogen penetrate through the catalyst? The mechanism of such "passage" has already been studied sufficiently well. Briefly, it consists in the following. First, hydrogen molecules are adsorbed on the surface of the catalyst. The distance between the atoms in adsorbed molecules is greater than in molecules in a gas phase, and, consequently, they more easily decompose into atoms which move deep into the crystal lattice, "dissolving" in it in a very definite amount depending on the temperature. The hydrogenized substance which is on the other side of the catalysts "draws" them out and combines them with itself.

Plus-Minus Hydrogen

Since it is possible to use membrane catalysts for conducting reactions both with addition of hydrogen, and with its removal, is it not possible to accomplish

them simultaneously? We had an answer to this problem when we discovered the phenomenon of the so-called conjugation of reactions. What does this mean?

On one surface of the catalyst, the substance is dehydrogenated (this process progresses with liberation of hydrogen and absorption of a large amount of heat), and on the other, the forming hydrogen combines with the unsaturated substance. The heat released at that time is used in the first reaction. Thus, energy is conserved to a considerable degree, because it is not necessary to supply it from outside: it is released in the spontaneously progressing reaction. The phenomenon of conjugation discovered by us was recorded as a discovery, and the conjugation reactions based on it are used widely in catalytic processes.

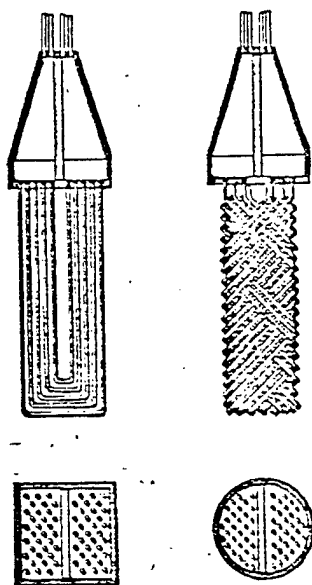


Conjugation reactions on the surface of the membrane catalyst: cyclohexanol is dehydrogenated into cyclohexanone which is necessary for the production of capron, and cyclopentadiene is hydrogenated into cyclopentene, a monomer for obtaining synthetic rubber.

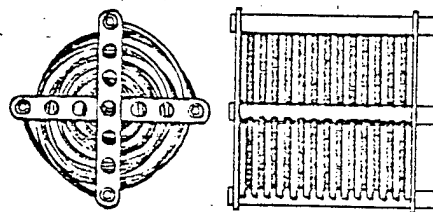
To Pass Hydrogen But not to Become Destroyed!

In order to implement this principle, it was necessary to select appropriate materials for membrane catalysts. Such materials are being developed in the Institute of Metallurgy of the USSR Academy of Sciences. It developed several dozens of alloys based on palladium. Alloys with a high penetrability for hydrogen and considerable strength were selected from them. These qualities are very closely connected. When palladium begins to absorb hydrogen (this stage is called "alpha"-phase), the crystal lattice of the catalyst remains unchanged. But then comes the so-called "beta"-phase: hydrogen penetrates the crystal lattice in large amounts and this sharply increases its volume, it "swells up". After multiple transitions from the "alpha"-phase into "beta"-phase and vice versa, there occur irreversible changes in the lattice, as a result of which the catalyst becomes brittle and is destroyed. The temperature of these transitions depends on the composition of the alloy from which the catalyst is made. Jointly with our colleagues from the Institute of Metallurgy of the USSR Academy of Sciences, we selected appropriate alloys: palladium plus

ruthenium, rhodium and nickel (they have been patented) which made it possible to shift the temperature of "alpha"- "beta" transitions to an area higher or lower than the one at which the hydrogenation or dehydrogenation reaction progressed. Thus, it was possible to avoid transitions dangerous for the catalysts.



Design variants of membrane catalysts.



Schematic of a membrane catalyst in the form of spirals of thin-walled tubes.

However, the strength of the catalyst depends not only on the material from which it is made, but also on its design. This was not a simple problem, and we had to work on it a lot. On the one hand, the catalysts must consist of thin-walled elements which pass hydrogen well, and on the other to be able to sustain high temperatures.

It was possible to combine such contradictory requirements by using the principle of mechanical similarity. It is known that the strength of any pipe depends on the ratio of its diameter to the thickness of the walls. For example, in a water pipe it is equal to 10. If its dimensions are reduced to one thousandth, this ratio and, therefore, its strength will remain the same: the principle of mechanical similarity will work. We made tubes from a palladium alloy with a diameter of 1 mm and wall thickness of only 0.1 mm, but they did not withstand pressure differences of 100 atmospheres.

In order to increase the productivity of the unit volume of the reaction vessel, we increased the surface of the catalysts: twisted the tubes into spirals. In order to avoid vibration of the tubes which led to the formation of cracks at the spots where they were soldered with the collectors, we superimposed the

spirals one upon the other in such a way that they would not slip. We obtained a block of tightly compressed double-start spirals facing each other. A reaction vessel with a catalyst of this design was made by the Special Design Bureau of the Institute of Petrochemical Synthesis of the USSR Academy of Sciences and was successfully tested on an experimental industrial scale. However, we do not consider this design variant to be optimal and we are now working on the development of a new and still stronger design.

Energy-Conserving Processes with Few Stages

In the near future all chemical processes must become energy-conserving and involve few operations. Membrane catalysts will play an important role in accomplishing this goal. We have already mentioned how energy is conserved in obtaining the necessary products with the aid of conjugation reaction. However, even if hydrogenation and dehydrogenation are done separately with these catalysts, it is also possible to conserve a considerable amount of heat and to reduce the number of stages of the technological process. Why is it so? Again, it is due to the high selectivity of the membrane catalyst.

For example, let us take the process of obtaining para-aminophenol, a photographic film developer. At the present time, this process is quite complicated, progresses in several stages and moreover is accompanied by the formation of harmful wastes: acid waste water. We proposed to use a membrane catalyst for it. It has been successfully tested at the Shostka Combine. In the new process, due to the high selectivity of the catalyst, no by-products form, i.e., it became wasteless. Moreover, para-aminophenol obtained by this process is much purer than in the old method.

The process of obtaining linalool by hydrogenating acetylene alcohol into ethylene alcohol is also of interest. It is also done with the use of a membrane catalyst and was developed at the Institute of Petrochemical Synthesis of the USSR Academy of Sciences and the Friendship of Peoples University. Linalool, which is a substance having the smell of the lily of the valley, is used widely not only in the perfume industry, but also in pharmacology. It is used to prepare a valuable medicine, cygerol, for treating burns and wounds. At the present time, it is obtained from corianders. Plantations of this plant occupy considerable areas in the Crimea and the Caucasus. By switching to the production of synthetic linalool, which is not any inferior in its quality than natural linalool, it will be possible to free these areas for growing other agricultural crops, for example grapes...

I have mentioned only a few processes performed with the aid of the membrane catalyst. Their advantage is not only the fact that they are energy-conserving and require few operations. These processes are also considerably less expensive than those which are conducted with the use of catalysts of other types, because they do not require hydrogen of particular purity, and "dirty" inexpensive technological gases are also quite suitable. The catalyst does not allow any impurity to pass into the reaction zone. It will separate hydrogen from the gas mixture, then will activate it having split it into atoms and, finally, will add it in the required amounts to the necessary agent for obtaining a valuable target product.

As you know, hotels have a key which can be used in cases of emergency to open any room. It is called "the master key". This name can be given to the membrane catalyst because it is a universal "key" to many various chemical reactions. This class of catalysts will, undoubtedly, play an important role in developing technological process of the future: wasteless, energy-conserving and requiring few stages.

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CSO: 1841/339

UDC 541.128

STRUCTURE AND PHYSICAL-CHEMICAL PROPERTIES OF SKELETAL PALLADIUM FROM Pd-Cu Melts

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 58, No 7, Jul 85
(manuscript received 6 Feb 84) pp 1531-1536

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Sciences

[Abstract] A study was made of the structure and physical chemical properties of Raney-Pd catalysts as prepared from Pd-Cu melts containing 3-25 atomic % Pd and annealed in stages under vacuum for 1206 hours. As the Pd content is increased, the surface area increases from 46 to 106 m²/g. X-ray studies of Raney-Pd melts containing 5-25 at. % Pd show lines corresponding to Cu-Pd solid solutions; no such lines were observed in samples containing 3-12.5 at.% Pd. Catalytic activity was studied in hydrogenation reactions of dimethylethyl carbinol (DMEC), phenylacetylene (PhA) and hexene-1 in various solvents. Maximum rate of hydrogenation of DMEC was observed in 96% ethanol with 91% selectivity. Kinetic curves of PhA hydrogenation in 96% ethanol show near zero order reaction to 55-60% saturation, beyond which the hydrogenation rate increases. Hydrogenation of hexene-1 in the same solvent takes place at a slower rate, the catalyst potential being shifted 70-90 mv. Chromatography shows that the double bond shifts to the beta-position followed by cis-trans isomerization of the resulting hexene-2. The specific surface, activity and selectivity of Raney-Pd are determined by the composition of the initial melt. Figures 3; references 15: 9 Russian, 6 Western.
[351-12765]

STUDY OF KINETICS AND SELECTIVITY OF HYDROGENATION OF ACETYLENIC CARBINOL C₂₀ (DEHYDROISOPHYTOL) IN A STREAM OVER CARRIED PALLADIUM CATALYSTS UNDER HYDROGEN PRESSURE

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 58, No 7, Jul 85
(manuscript received 13 Apr 84) pp 1536-1539

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[Abstract] Selective hydrogenation of dehydroisophytol (I) into isophytol (II), which is used in vitamin E and K synthesis, is currently a batch process, owing mainly to the lack of data on the reaction mechanism. In the present work a study was made of the effects of hydrogen pressure, temperature, feed rate and hydrogen percolation rate on the kinetics and selectivity of hydrogenation of compound I to compound II and the fully saturated C₂₀ alcohol (III) over three industrial palladium catalysts. In the presence of 0.5% Pd/ShN-2, the catalyzate composition varied from 49-50% to 42-43% of compound II as the hydrogen percolation rate was raised from 60 to 100 cm³/min, while the content of compound III increased from 20-21% to 39-40%, and the amount of unreacted compound I decreased from 30-31% to 17-18%. Raising the temperature from 303 to 343K lowered the yield of II but increased that of III. Analogous results were obtained with 0.75% PdShAS and P-5 catalysts. The catalysts' activity may be ranked: 0.5% PdShN-2 > 0.75% PdShAS > P-5. Selectivity is in the opposite order. Figure 1; references 4 (Russian).
[351-12765]

EFFECT OF PROPERTIES OF ZEOLITE CATALYSTS ON CRESOL FORMATION FROM PHENOL AND TOLUENE

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 58, No 7, Jul 85
(manuscript received 6 Feb 84) pp 1539-1542

KOZHEVNIKOV, S. A., MOTOVILOVA, N. N., SIBAROV, D. A. and VINOGRADOV, M. V., Leningrad Technologic Institute imeni Lensovet

[Abstract] The chief problem in raising the yield of cresol in trans-methylation of phenol with toluene is catalyst selection. Zeolites are known to be most active, especially if they contain rare earth element oxides to stabilize them. This alters their surface characteristics, however, and changes the molecular behavior of initial components adsorbed on their surface. In the present work, a study was made of the adsorption

properties of six zeolite catalysts in respect to phenol and toluene and the relationship of adsorption to composition. Adsorption energies and quantities of adsorbed phenol from a 1:1 molar ratio of phenol to toluene were determined chromatographically at 180, 190, 200 and 210°C. Cresol synthesis data for the same mixtures at 450°C are presented in a table. Comparison of the adsorption data with that of the synthesis shows that the quantity of adsorbed phenol is the basic factor. For type Y zeolites, selectivity of phenol and toluene conversion is inversely proportional to adsorbed phenol content. With type X zeolites, cresol is formed despite large quantities of adsorbed phenol. Lowering the quantity of adsorbed phenol on the zeolite surface, therefore, increases the stability and selectivity of cresol synthesis from toluene and phenol. References 5 (Russian).
[351-12765]

UDC 541.183.24:66.094.373

EFFECT OF INITIAL pH VALUE OF SILICON DIOXIDE HYDROSOL ON PROPERTIES OF CATALYST FOR OXIDATIVE AMMONOLYSIS OF PROPYLENE

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 58, No 7, Jul 85
(manuscript received 26 Apr 84) pp 1543-1546

VALYUKHOV, A. A., BOLOTOV, I. M., NAZAROV, V. V., FROLOV, Yu. G.,
RESHETNIKOVA, L. V. and KHORKIN, A. A.

[Abstract] Silicon dioxide hydrosol is a promising catalyst carrier, but the colloid chemical principles governing the synthesis of these catalysts is not clear. In the present work, a study was made of the effects of initial pH values of the silica carrier on the properties of a catalyst for oxidative ammonolysis of propylene. Catalysts were prepared in paste form from a hydrosol containing 40% SiO₂ and various electrolytes and maintained for 7 days at pH 8, 8.5, 9, 9.5 and 10. Rheological properties varied with the pH, e.g., viscosity increased with rising pH. This is apparently due to the varying amount of soluble component in the hydrosol. Data thus indicate that the properties of a finished catalyst for oxidative ammonolysis of propylene depend on the initial pH. To further check this, three catalyst samples were prepared at pH 8, 9, and 10. Nitrogen adsorption isotherms showed that pore size changed from 60 to 75 Å from the pH 8 sample to that of the pH 10. Preliminary results indicate that it is possible to obtain satisfactory catalysts by varying the pH of the initial hydrosol. Catalyst attrition also decreases with rising pH. Figures 3; references 8:
7 Russian, 1 Western.
[351-12765]

HYDROGEN PEROXIDE REDUCTION AND DECOMPOSITION CATALYSTS

Moscow ELEKTROKHIMIYA in Russian Vol 21, No 7, Jul 85
(manuscript received 14 Jun 83; in final form 29 Feb 84) pp 908-911

KICHEYEV, A. G., KALMYKOVA, S. B., KVASHNIN, Yu. A., SAVEL'YEVA, V. N. and
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[Abstract] A number of metallic electrodes were tested for their behavior in promoting hydrogen peroxide reduction and decomposition, in view of the paucity of quantitative information on such phenomena. Analysis of the volt-ampere characteristics of hydrogen peroxide reduction demonstrated that the Ag electrode was most active in a system employing 0.5 M H_2O_2 in 7 M KOH. The Ag electrode was followed by, in decreasing order of activity, Pd/Raney-Ni, Pd, Pt and Raney-Ni electrodes. The nonconducting potential difference between Ag and the most inactive electrode (Raney-Ni) was 0.18 V. Gasometric measurements of the rate of electrode-mediated decomposition showed that Ag was the most active electrode with a rate of catalytic decomposition of 1.5×10^6 moles/cm²·sec, and Raney-Ni the least active electrode (0.039×10^6 moles/cm²·sec). Again, Pd and Pt electrodes were in intermediate positions. Graphical correlation of the currents for reduction and decomposition demonstrated a direct correlation between these two effects, and indicated that electrochemical reduction and catalytic decomposition of hydrogen peroxide are different stages of a single H_2O_2 conversion mechanism. Figures 3; references 8: 7 Russian, 1 Western.
[365-12172]

REDUCTION OF AROMATIC COMPOUNDS AND THEIR DERIVATIVES ON PLATINUM ELECTRODES

Moscow ELEKTROKHIMIYA in Russian Vol 21, No 7, Jul 85
(manuscript received 3 May 84) pp 968-970

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[Abstract] Comparative data were obtained for the reduction of selected aromatic compounds and their derivatives on platinum electrodes, in order to define the sequence of reduction of the various groups in relation to the benzene nucleus. Analysis of the polarization plots and rates of reduction of chlorobenzene, phenol and benzene led to determination of standard reduction potentials for the compounds and substituents of interest. In the case of chlorobenzene, reduction commences at $E \sim 0.25$ V, i.e., at a potential at which the benzene ring remains unreduced. Evidently, at this E value, the primary process is reduction of chlorobenzene by adsorbed

hydrogen with chlorine removal, according to the following equation:
 $C_6H_5Cl + 2e + H^+ \rightarrow C_6H_6 + Cl^-$. At a E value of ca. 0.15 V virtually identical polarization plots are obtained for phenol and benzene, indicating simultaneous saturation of the aromatic nucleus (benzene \rightarrow cyclohexane) and removal of the OH group (phenol \rightarrow benzene). Figures 2; references 11: 2 Russian, 9 Western.
[365-12172]

UDC 541.14

PHOTOCATALYTIC CURRENT ON MERCURY ELECTRODE IN ACIDIFIED ETHYLENE GLYCOL SOLUTIONS OF TRIBENZYLAMINE

Moscow ELEKTROKHIMIYA in Russian Vol 21, No 7, Jul 85
(manuscript received 8 Jun 84) pp 987-990

KOKILASHVILI, R. G., DZHAPARIDZE, Dzh. I. and PLESKOV, Yu. V., Institute of Electrochemistry imeni A. N. Frumkin, USSR Academy of Sciences, Moscow; Institute of Inorganic Chemistry and Electrochemistry, Georgian SSR Academy of Sciences, Tbilisi

[Abstract] In order to explain light-induced currents on mercury electrodes and hydrogen production in acidified ethylene glycol solutions of tribenzylamine, a detailed analysis was conducted on the relationship between photocurrent intensity and light intensity (365 and 442 nm), and the energy levels of tribenzylammonium cation adsorbed to the electrode. Photocurrents were not detected in solutions lacking tribenzylamine, nor in neutral or unacidified solutions, indicating the involvement of the tribenzylammonium cation. The data suggest that the adsorption band of the cation adsorbed on mercury is shifted toward lower energies of absorption in comparison with the tribenzylammonium in solution, with the end result that light unabsorbed in solution is absorbed by the adsorbed cation. The net result is the photoreduction of the adsorbed tribenzylammonium cation to tribenzylammonium- H^+ (I), followed by the sequence $I + H^+ + e^-(M) \rightarrow$ tribenzylamine + H_2 , where $e^-(M)$ is the electron from the mercury electrode. Figures 4; references 4 (Russian).
[365-12172]

ANILINE CONVERSION OVER NICKEL-CHROMIUM CATALYST IN HYDROGEN ATMOSPHERE

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA
in Russian No 4, 1985 (manuscript received 28 Feb 84) pp 19-23

SOKOLSKIY, D. V., UALIKHANOVA, A. and MAYLYUBAYEV, B. T., Institute of
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[Abstract] Selective hydrogenation of aniline into cyclohexylamine or dicyclohexylamine is of great practical interest since alicyclic amines are used in the paper industry, pharmaceuticals, caprolactam production, anti-corrosive coatings and explosives. Although much has been published on aniline hydrogenation, the kinetics and reaction mechanism have not yet been well studied. In the present work aniline hydrogenation over a nickel-chromium catalyst is shown to be a zero order reaction in respect to aniline. It approaches first order in respect to hydrogen at 2-4 MPa, and then reverts to zero order. Cyclohexylamine yield increases with hydrogen pressure and decreases with temperature. The change in yield also varies with the cyclohexanol content in the catalyst. The yield of secondary amine stays constant. Figures 2; references 8: 2 Russian, 6 Western.
[353-12765]

OXIDATIVE AMMONOLYSIS OF p-METHOXYTOLUENE OVER VANADIUM-TITANIUM OXIDE CATALYSTS

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA
in Russian No 4, 1985 (manuscript received 22 Jun 83) pp 66-71

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[Abstract] The reaction of oxidative ammonolysis of p-methoxytoluene appears promising as a method for preparing p-methoxybenzonitrile, which may be used in the synthesis of pesticides and liquid crystals. In the present work, a study was made of the oxidative ammonolysis of 4-methoxytoluene over vanadium and titanium catalysts prepared by heating their oxides. It was found that p-methoxybenzonitrile yields of 50% with 60% selectivity could be achieved at 1:35:14:50 mole ratios of p-methoxytoluene, air oxygen, ammonia and water at 0.6 sec contact time and 320-340°C. Figures 2; references 14: 11 Russian, 3 Western.
[353-12765]

EFFECTS OF PYRIDINE ON DEHYDROGENATING ACTIVITY OF Al-Pt CATALYST

Minsk DOKLADY AKADEMII NAUK BSSR in Russian Vol 29, No 7, Jul 85
(manuscript received 30 Jul 84) pp 613-614

SEN'KOV, G. M., PRYAKHINA, N. Ya., KOZLOV, N. S., academician, Belorussian SSR Academy of Sciences, PUSHKAREV, V. P. and FOKIN, V. A., Institute of Physical-Organic Chemistry, Belorussian SSR Academy of Sciences

[Abstract] To determine whether nitrogenous compounds function as catalytic poisons in analogy to sulfur compounds, an assessment was made of the relative effects of pyridine and thiophene on cyclohexane dehydrogenation to benzene over Al-Pt catalysts at 573°K. Analysis of the kinetic data and benzene synthesis demonstrated that addition of 0.01 wt% pyridine reduced the catalytic activity of industrial AP-64 Al-Pt catalyst to 85% of baseline activity. Addition of thiophene to the system to an equivalent concentration reduced the catalytic activity to 5% of the baseline activity. Thus, while pyridine inhibited cyclohexane dehydrogenation over Al-Pt, the effects were far less serious than the degree of inhibition obtained with thiophene. Figures 1; references 3: 2 Russian, 1 Western.
[330-12172]

OZONE DECOMPOSITION ON SELECTED HETEROGENOUS CATALYSTS

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 7, Jul 85
(manuscript received 13 Jul 83) pp 1636-1640

SABITOVA, L. V., POPOVICH, M. P., SMIRNOVA, N. N. and FILIPPOV, Yu. V., Chemical Faculty, Moscow State University imeni M. V. Lomonosov

[Abstract] A method was devised for the measurement of ozone decomposition over heterogenous catalysts applied to thermoresistors serving as the two shoulders of a constant current bridge. On this basis, ozone decomposition was measured as the heat released during its transformation into oxygen. Studies with the powdered systems 5Co-2.5Ag, 5Ni-2.5Ag-5Co, 5Ni-2.5Ag, 5Ni-5Co and Ag-activated hopcalite under pressures ranging from atmospheric to 10 mm Hg demonstrated that the process could be controlled by the quantity of applied catalyst. Low levels of catalyst resulted in a gradually decreasing rate of conversion due to inactivation of active sites. Higher levels of catalyst (essentially lamellar application) resulted in a steady-state process due to diffusion of ozone into the deeper layers of the catalyst. Figures 4; references 19: 8 Russian, 11 Western.
[356-12172]

HEMIN AS ELECTRON CARRIER IN MODEL CATALYTIC SYSTEMS

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 7, Jul 85
(manuscript received 20 Jul 83) pp 1641-1643

ASTANINA, A. N., KARPOV, V. V., TRUSOV, P. Yu. and RUDENKO, A. P.,
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[Abstract] An aqueous system was devised for the reduction of cysteine in a model catalytic system involving hemin, to determine whether hemin could function in electron transport analogous to its function in cytochrome b. Maximum cysteine oxidation was obtained at pH 8.0, with the reaction showing first order kinetics in cysteine. The energy of activation for the oxidation of cysteine was calculated at 15.2 kcal/mole. Changes in Fe valency were indicated by the fact that the absorption bands of the hemin changed from 370, 386, 497 and 613 nm to 364, 515 and 649 nm on addition of excess cysteine. This change suggested a transition from the Fe^{3+} to the Fe^{2+} state. The entire process appears to consist of reduction of the oxidized form of the catalyst by cysteine, and subsequent oxidation of the reduced catalyst by oxygen in the system. Figures 3; references 7: 6 Russian, 1 Western.
[356-12172]

CHEMICAL INDUSTRY

CHEMICAL INDUSTRIES LACKING IN ECONOMIZATION EFFORTS

Moscow IZVESTIYA in Russian 14 Jun 85 p 2

[Article by Yu. Grin'ko: "Linking Thrift to Creativity"]

[Text] The permanent commissions for industry of the Soviet Union and of the Council of Nationalities of the USSR Supreme Soviet held a joint meeting in the Kremlin. Fulfillment of state plan quotas for improving use and economization of raw materials, materials, fuel and energy resources by the USSR ministries of chemical industry and petroleum refining and petrochemical industry was examined.

The meeting was run by A. V. Vlasov, chairman of the Commission for Industry of the Council of Nationalities. Reports were given by Minister of Chemical Industry V. V. Listov and Minister of Petroleum Refining and Petrochemical Industry V. S. Fedorov and Deputy D. P. Galkin gave a report from the joint deputies' preparation commission. Communications from USSR Gosplan Deputy Chairman I. A. Lukashov, GKNT [State Committee for Science and Technology] Deputy Chairman K. M. Dyumayev and USSR Gosplan Deputy Chairman A. N. Lebed' were heard as well.

The following were noted during the meeting: In 1981-1984 the rate of growth of the total production volume of the ministries surpassed the rate of growth of material outlays. In 1984 the sectors fulfilled their socialist pledges for additional reduction of product cost and for growth in labor productivity. Nonetheless serious shortcomings and significant unutilized reserves exist in the activities of chemists and petrochemists.

In its resolution the commission recommended specific measures to the USSR Ministry of Chemical Industry and the USSR Ministry of Petroleum Refining Petrochemical Industry directed at improving economization efforts. In particular, attention was turned toward the need for significantly improving standardization of consumption of raw materials, materials, fuel and energy, hastening introduction of progressive norms, publicizing and introducing the best experiences in economization more widely, and rebuilding and reequipping existing enterprises more aggressively in order to significantly improve the use of resources.

Chemistry and petrochemistry are among the most materials-intensive sectors of the national economy. And of course, the problem of making thrifty use of raw materials, electric power and fuel is of special significance to them. In the last four years, ministers V. V. Listov and V. S. Fedorov reported, the departments managed to achieve some positive results. Thus while the total volume of material outlays increased by 11.2 percent for the chemists and by 5.8 percent for the petrochemists, commercial production grew correspondingly by 19.4 and 8.4 percent. A search is being made for ways to improve standardization of the consumption of material resources: The Ministry of Chemical Industry has automated the accounting, updating and creation of material norms and standards, and a system regulating the procedures for developing the norms for losses of oil and petroleum products is operating in the USSR Ministry of Petroleum Refining and Petrochemical Industry. But as department executives have admitted, many state quotas for the average reduction of the norms for expenditure and economization of resources are not being fulfilled from year to year. For practical purposes the specific norms for their consumption are still what they were five years ago. And in relation to some raw materials they have even grown.

What is the problem here?

This question cannot be answered simply. There are many causes. And perhaps the most significant among them was voiced in a speech by Deputy M. V. Yuferova, an operator at the Polimir Production Association imeni 50-Letiye Belorusskoy SSR.

"Strange as it may seem," Margarita Vasil'yevna said, "we the chemists still do not have scientifically grounded norms for raw material expenditure in relation to many kinds of products. Some are obviously low, they are easily surpassed, and therefore they are worthless--they do not encourage thrift in any way. At the same time we often encounter cases where the ministry's quotas concerned with reducing the norms for expenditure of raw materials and energy resources are lower than planned. Need it be said that this also does not have the best effect on raising the effectiveness of our work?"

M. V. Yuferova cited this example. The Polimir Association assimilated production of a new product--a compound with improved properties consisting of polyethylene and "nitron" fiber. The actual outlays of raw materials and energy resources on their production have remained unchanged over a number of years. But the cost of polyethylene has managed to decrease by 1.5 percent in 4 years of the five-year plan, while that of fiber has been decreased by 8 percent. Nonetheless the Ministry of Chemical Industry takes every opportunity to reduce the norms for consumption of raw materials and electric power on their production with a stubbornness that could be put to better use elsewhere. And thus it undermines the stimuli for increasing production of high quality products.

The obvious question is, who needs such "planning"?

The fact that chemists and petrochemists prefer to ignore state discipline in their work is not at all something unusual. Preferring not to burden themselves with extra cares, they fearlessly (and with impunity) calculate and send

enterprises quotas on resource economization which are significantly below the level approved for the ministries by the national economic plan! For example in 1984 the Ministry of Chemical Industry set an average reduction of the expenditure norms for its subordinates that was lower than foreseen by the plan by a factor of 2 for soda ash, by a factor of 1.6 for sodium sulfate, and for plasticizers, how much would you guess? A factor of 35!

It is to be pitied that in turn, the USSR Gosplan and the USSR Gosstnab also determine quotas for the ministries without sufficient analysis of the real possibilities and of the conditions of their work. Here is what happens as a result of all of this. Last year the USSR Ministry of Petroleum Refining and Petrochemical Industry reported victoriously that the quota for economization of sulfur was surpassed by a factor of 6.8, that for caustic soda was surpassed by a factor of 4, for benzene it was surpassed by 4.1, for ammonia it was surpassed by 3.4, and for sodium sulfate it was surpassed by a factor of 4.1.

And so the bonuses were paid out. But the following question arises. What sort of quotas are these if they can be easily surpassed by several orders of magnitude?

From the joint resolution of the commission: That it be recommended to the USSR Gosplan, the USSR Gosstnab and the USSR State Statistical Administration that they examine, jointly with the USSR Ministry of Chemical Industry and the USSR Ministry of Petroleum Refining and Petrochemical Industry, the question of improving the procedures for planning and accounting economization of raw materials, materials, fuel and energy, with the objective of improving the grounds for planning quotas and establishing better accountability.

Chemistry penetrates deeply into the affairs of man--so it was noted long ago by M. V. Lomonosov. Its possibilities are truly vast. Today chemical products are displacing expensive natural raw materials throughout the national economy, and helping to save live and materialized human labor. The state is allocating enormous assets for development of chemical industry.

How effectively are they being utilized? This is a problem that evoked keen and impartial discussion among the participants of the joint meeting of the industrial commissions.

Deputy V. A. Orlov, a rolling-press operator at the Zaporozhstal' Metallurgical Plant, asked to speak after hearing Minister V. S. Fedorov's report.

"Viktor Stepanovich," he asked the minister, "do you think it is normal for equipment designed on the basis of plans almost half a century old to be working in petrochemistry today? In fire cracking for example? Could we seriously talk about sensible management in the presence of such technology? Does the sector intend to seriously deal with modernization and reconstruction?"

The chairman spoke: "Do you understand the question?"

V. S. Fedorov replied: "I understand the question. You are referring to failure of the plan for capital construction, including construction of facilities for deep refining of oil. Things are in fact unsatisfactory in this area. But we are fulfilling the production plan."

The minister was reminded that during the current five-year plan his department allocated only 12 percent of the total capital investments to construction of facilities for deep oil refining. This was unjustifiably low. And even those assets have been only three-fourths utilized each year.

Last year five new installations were to be placed into operation in accordance with a government decree. One was put into operation. Out of eight construction starts of this year, six are not to be completed until the following five-year plan. This means that the country will fall short by a million tons of motor fuel.

In this way, possibilities for sensibly allocating assets and resources that had not been capitalized on yesterday transform into today's waste.

Construction of new output capacities and reconstruction and modernization of existing production operations is simply unfeasible economically today if such efforts are not based on the best accomplishments of progress. "One more step along the road of transforming the chemical sector into a wasteless sector will be made in the 12th Five-Year Plan," Minister V. V. Listov assured the meeting of the commissions.

But would this bring us any closer to our goal if this step is not longer than usual? It followed from Deputy D. P. Galkin's joint report that in the past years of the 11th Five-Year Plan, the Ministry of Chemical Industry had never (!) managed to meet the quotas of the state plan in regard to its sections such as "Development of Science and Technology," "Introduction of New Technology" and "Scientific-Technical Programs."

This is true in relation to other sections as well.

For almost two decades in a row the sector has been working on membrane technology for production of caustic soda. Enormous assets have been spent, but the industrial use of the innovations called upon to reduce energy outlays, increase safety and improve working conditions is still not to be expected until some time far in the future.

From the joint resolution of the commissions: That low-waste and wasteless production processes be consistently introduced into production, and that development of production processes making it possible to significantly improve utilization of material resources and make a more active effort to reconstruct and reequip existing enterprises be widened and accelerated.

As we know, secondary resources first became an object of centralized planning in the current five-year plan. This emphasizes the great importance of making maximum use of industrial wastes. Significant capital investments are being

allocated to the development of capacities for collecting and processing secondary raw materials. Stroybank loans can even be used for this purpose. Much depends today on initiative and resourcefulness. But alas, as we can see, these are precisely the qualities that chemists and petrochemists lack.

The participants of the joint meeting of the industrial commissions subjected the USSR Ministry of Petroleum Refining and Petrochemical Industry to sharp and justified criticism for being intolerably slow in increasing the volume of motor vehicle tires subjected to repair and restoration, and in processing irreparable tires into recycled products, into rubber powder and into other useful materials. The deputies brought up the following fact: In the current five-year plan the ministry was ordered to build seven installations to process worn tires by a new method in which industrial carbon could be produced without oil, but the sector has just begun drawing up plans for erecting the first of these installations next year.

Efforts to reclaim spent oil and to procure and process polymers are not being managed well at all. The chemists are generous in their promises to correct the situation, but they are in no hurry to fulfill these promises. The needed output capacities are being built at a turtle's pace, and those which are already in existence are working at only half their load: Collection of the raw materials has not been organized properly.

"Another important problem which is directly associated with sensible use of material resources and which also awaits its solution is protection of metals against corrosion," said Deputy N. T. Turapov, first secretary of the Kashka-Darya Oblast Committee of the Uzbek SSR Communist Party, in his speech.

"According to the testimony of experts, each year the losses due to corrosion total several billion rubles. Consequently the task is to provide the national economy with the resources it needs for protecting metals.

"A tested method of fighting rust is use of varnishes and polymers, petroleum-based bitumen, synthetic rubber and latex, asbestos articles and fiber glass. The USSR Ministry of Chemical Industry and the USSR Ministry of Petroleum Refining and Petrochemical Industry are satisfying less than half of the demand for these materials. In the last few years the production volume has even been decreased in relation to some of these progressive materials. It must be said that the quality of resources for protecting metal against corrosion also frequently leaves much to be desired. For some reason the chemists have something against stable, inexpensive water-emulsion paints, preferring to work in the old way with organic dyes.

"It is disconcerting that the departments are not foreseeing allocation of the capital investments necessary to hasten creation of the appropriate production operations in the 12th Five-Year Plan," N. T. Turapov concluded. "In this connection I would like to make the following suggestion: We should ask the USSR Council of Ministers to specially examine the prospects for providing the national economy with progressive resources for protection of metals against corrosion, and to instruct the USSR Gosplan, the USSR Ministry of Chemical Industry and the USSR Ministry of Petroleum Refining and Petrochemical Industry to draw up measures for accelerated development of their production.

From the joint resolution of the commissions: That introduction of the maximum quantity of all forms of secondary raw materials and production wastes into the economic turnover be foreseen in the plans for economic and social development in 1986-1990.

That it be recommended to the USSR Gosplan, the State Committee for Science and Technology, the USSR Ministry of Chemical Industry and the USSR Ministry of Petroleum Refining and Petrochemical Industry that jointly with other interested departments they examine this question, and hasten, to the extent possible, growth of production of polymers and articles made from them that replace metals and other traditionally used products, production of progressive resources for protecting metals against corrosion, and production of energy-saving catalysts.

Considering the importance and acuity of the problems discussed, the deputies submitted the proceedings of the industrial commissions of the Soviet Union and the Council of Nationalities for examination to the USSR Council of Ministers, requesting that the latter issue the necessary instructions to the appropriate ministries and departments.

11004

CSO: 1841/320

UDC 658.589.011.46:678.05.002.2

ASSESSMENT OF COST EFFECTIVENESS OF NEW TECHNOLOGY IN MACHINE CONSTRUCTION
FOR POLYMER INDUSTRY

Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 8,
Aug 85 pp 40-41

SHULYAKOVSKIY, V. K., engineer

[Abstract] Description is provided of rationale and formulations employed at the Ukrainian Scientific Research Institute of Plastic Industry Machine Construction for assessing the cost effectiveness of proposed machines. The underlying assumptions are that new machinery, to be economically effective and useful to the State, must justify the expenditures inherent in their research, design, development, testing and eventual industrial use. A cost effectiveness coefficient (K) has been derived and proposed as a criterion for determining the cost effectiveness of proposed machinery in the long run. The new technology has to be characterized by an estimated K of 1.15 or better to receive serious consideration for development and implementation. The use of this approach to cost effectiveness has already resulted in a savings of 500,000 rubles at the Institute in 1985 alone. References 4 (Russian).
[364-12172]

UDC 620.197.3

CORROSION PROTECTION OF EQUIPMENT USED FOR POTASH TREATMENT OF HYDROGEN TO
REMOVE CARBON DIOXIDE

Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 7, Jul 85
pp 28-29

MAKSIMOVA, G. F. and D'YAKOV, V. G., candidates of technical sciences and
SHIBRYAYEV, B. F., doctor of technical sciences

[Abstract] Modern high capacity installations for producing hydrogen gas employ potash absorbers to remove carbon dioxide, a by-product. Corrosion

resistance tests carried out at the All-Union Scientific-Research and Project Design Institute of Petroleum Machine Building show that carbon and low-alloy steels cannot be used in equipment for potash treatment unless special methods are used. Steels 12Kh18N10T, 08Kh21N6M2T, 08Kh22N6T, 03Kh13AG20, 07Kh13AG20, 06Kh17G17DAMB and 08Kh18G8N2T show high corrosion resistance under these conditions and may be used for this purpose. They may be substituted with steel 12Kh18N10T. Reference 1 (Russian).
[344-12765]

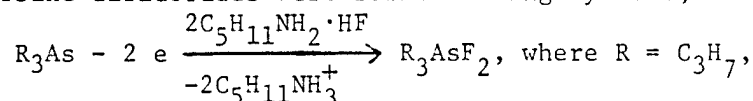
UDC 541.138.2

ELECTROCHEMICAL SYNTHESIS OF TRIALKYL(ARYL)ARSINE DIFLUORIDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 55, No 7, Jul 85
(manuscript received 18 Jul 84) pp 1496-1498

PARAKIN, O. V., NIKITIN, Ye. V., IGNAT'YEV, Yu. A., ROMAKHIN, A. S. and
KARGIN, Yu. M., Kazan State University imeni V. I. Ul'yanov-Lenin

[Abstract] A delineation was made of the electrochemical parameters involved in preparative synthesis of trialkyl(aryl)arsine difluorides, through an analysis of the oxidation waves in the presence and absence of pentylammonium fluoride. Oxidation of tertiary arsines on platinum electrodes in the presence of pentylammonium fluoride is accompanied by a decrease in the amplitude of the wave and its shift to less positive potentials, with the oxidation plots showing a greater angular coefficient. These observations are consonant with a chemical interaction between the intermediate cation radicals of the tertiary arsines and the F^- which forms on electrolytic dissociation of pentylammonium fluoride in acetonitrile. As a result, trialkyl(aryl)arsine difluorides were formed in high yields, according to the equation



C_4H_9 , or C_6H_5 . References 3: 2 Russian, 1 Western.
[349-12172]

UDC 546.98:541.138

ELECTROCHEMICAL BEHAVIOR OF PALLADIUM IN CONCENTRATED SULFURIC ACID SOLUTIONS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 58, No 7, Jul 85
(manuscript received 10 Dec 84) pp 1634-1637

KRASIKOV, B. S. and GORDEYEVA, T. V.

[Abstract] A study was made of the palladium ion discharge and ionization processes in solutions containing $Pd(II)$ ions in 38% sulfuric acid. The

study shows that palladium ions exist in concentrated sulfuric acid in the form of weakly coordinated complexes with SO_4^{2-} ions, while the discharge-ionization processes in the Pd(II) - Pd system take place with two electrons acting in the slow stage. Apparently, there are no chemical stages preceding discharge in highly concentrated sulfuric acid solutions. Figures 4; references 6 (Russian).
[351-12765]

UDC 541.135

ORGANIC COMPOUND ELECTROSYNTHESIS IN SOLID POLYMERIC ELECTROLYTES

Moscow ELEKTROKHIMIYA in Russian Vol 21, No 7, Jul 85
(manuscript received 2 Mar 84) pp 933-937

RODIONOVA, N. A., AVRUTSKAYA, I. A., FIOUSHIN, M. Ya. and KHRIZOLITOVA, M. A.,
Moscow Institute of Chemical Technology imeni D. I. Mendeleev

[Abstract] Comparative studies were conducted on conventional organic electrosynthesis, and electrosynthesis carried out in solid polymeric electrolytes designated as MF-4SK, reinforced MF-4SK, MK-40 and Nafion. Evaluation of the rate constants and yields for the reduction of triacetone-amine to piperidol, of the azine and oxime of triacetone-amine to aminopiperidine, and for the oxidation of isobutanol to isobutyric acid demonstrated that the rate constants for conventional electrosynthesis were several-fold greater and the yields concomitantly greater. However, addition of electrolytes to the solid polymers in contact with the electrodes improved the rates and yields, as illustrated by the electrosynthesis of aminopiperidine. In the latter case, addition of 0.25 N sulfuric acid increased the yield to 98% per substance and 75% per current, versus corresponding figures of 98 and 70% for conventional electrosynthesis in 1.0 N sulfuric acid. In the absence of the added electrolyte, the solid polymeric electrosynthesis yields were 57 and 9.5% respectively. Figures 4; references 11: 5 Russian, 6 Western.
[365-12172]

OXIDATION OF CYANIDE IONS ON Pt ANODE

Vilnius TRUDY AKADEMII NAUK LITOVSKOY SSR: SERIYA B in Russian Vol 3, 1985 (manuscript received 8 May 84) pp 28-37

ALAUNE, Z. B., MAZHEYKENE, R. A. and VISHOMIRSKIS, R. M., Institute of Chemistry and Chemical Technology, LiSSR Academy of Sciences

[Abstract] During electroplating of various metals employing cyanide solutions and insoluble anodes, cyanide ions are oxidized at the anode to form compounds which are detrimental to the quality of the metal coating and therefore require regeneration of the plating bath. In the present work, the oxidation of CN^- ions on a Pt anode was studied at acid ($pH = 3.4$) and alkaline ($pH = 11.5$ and 13.5) conditions by determining cyanide consumption and analysis of resulting compounds. During the oxidation, CO_2 , NH_3 , N_2 , CO and N_2O are formed as end products. Maximum cyanide consumption occurs at $pH = 11.5$. In alkaline solutions, the cyanate formed is subject to hydrolysis and anode oxidation. Much of the N_2O and CO are formed during electrolysis of acid solutions, and, as the pH is increased, the yields become less. Oxygen yield as a function of electric current depends on the pH of the solution and becomes minimal at $pH = 11.5$. Figures 3; references 13: 4 Russian, 9 Western. [354-12765]

INTERACTION OF SLOW NEUTRONS WITH WATER IN PERICRITICAL REGION AND MECHANISM OF LIQUID-VAPOR TRANSITION

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 7, Jul 85 (manuscript received 24 Aug 83) pp 1671-1676

LISICHKIN, Yu. V., NOVIKOV, A. G. and FOMICHEV, N. K.

[Abstract] In order to study the molecular mechanism of water liquid-vapor transitions studies were conducted on the interaction of $E_0 = 7.25$ meV slow neutrons with water. Inelastic scatter spectra were obtained and analyzed for 5 density points at 327, 360 and 400°C over a density range of 0.0005 to 0.32 g/cm³. Spectra derived in the infra- (360°C) and supra-critical (400°C) temperature regions support the view that, in the transitional density area above the critical constant, water vapor consists of a mixture of two phases. These phases are a supercritical liquid (fluid) and an ideal gas represented by water molecule monomers. The relative concentrations of these phases is density dependent, while their physical characteristics are constant throughout the entire transitional region. Thus, association of water molecules in the vapor under these conditions involves generation of heterophasic fluctuations characterized by the

properties of a liquid phase (fluid), bypassing essentially the gaseous phase, consisting of associations of a small number of water molecules. Figures 5; references 19: 11 Russian, 8 Western.
[356-12172]

UDC 541.12.034.2

ELECTROPHYSICAL STUDIES ON NIOBIUM-POLYETHYLENE SYSTEMS

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 7, Jul 85
(manuscript received 21 Jul 83) pp 1793-1794

ZHDANOV, K. R., KHOROSHILOV, A. A., RAKHMENKULOV, F. S., ROMANENKO, A. I.,
MARDASHEV, Yu. S., KHLISTUNOVA, E. V. and GUBIN, S. P., Moscow State
Pedagogic Institute imeni V. I. Lenin

[Abstract] Several niobium-polyethylene compositions differing in the concentration of niobium were studied by electrophysical means, including electrical resistance and magnetic susceptibility. The data were combined to indicate that in composites in which the metal exceeded the critical concentration 1.5- to 2-fold resistance disappeared. At lower metal concentrations, the samples behaved as dielectrics. Figures 2; references 8: 1 Russian, 7 Western.
[356-12172]

EXPLOSIVES AND EXPLOSIONS

UDC 620.163.6.05

SIMULATION STAND FOR CONDUCTING EXPLOSIVE TESTING

Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 7, Jul 85
pp 22-23

NASONOV, V. V., candidate of technical sciences [deceased], and
MIROSHNICHENKO, A. B., and BOYTSOV, A. B., engineers

[Abstract] While developing a system of explosion protection for an acetylene storage station, the Voronezh Branch of the All-Union Scientific-Research and Design Institute of Autogenous Machine Building proposed a method for studying the rapid action of explosion protection systems by using a light detector to record simulated light impulses. A diagram of the test stand is presented by which it is possible to simulate flame propagation in the trunk line of explosive gases. The device consists of a photographic camera, light detector, electric discharger, electronic timer, step-up transformer, light source supported on a calibrated stand and a microcomputer. Figures 4.
[344-12765]

FERTILIZERS

UDC 661.663.3:537.523

STUDY OF PROCESSES FOR OBTAINING CONCENTRATED PHOSPHORUS-POTASSIUM FERTILIZERS EMPLOYING LOW TEMPERATURE PLASMA. REPORT I

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA
in Russian No 4, 1985 (manuscript received 27 Sep 83) pp 6-12

VOYCHAK, V. P., DYANKOVA, N. Ya., IBRAYEV, Sh. Sh., KALMYKOV, S. I. and
MESSERLE, V. Ye. Institute of Chemical Sciences, KaSSR Academy of Sciences,
Alma-Ata

[Abstract] Concentrated mixed fertilizers are produced in the Soviet Union and elsewhere by multi-stage processes involving phosphoric acid or elemental phosphorus. While a method has been proposed which by-passes the phosphoric acid stage, it still includes the costly and complex elemental phosphorus stage. Reduction of natural phosphates with gaseous hydrocarbons in a low temperature plasma field appears promising, and the thermodynamics of the reactions involving tricalcium phosphate, silicon dioxide and potassium chloride were calculated to determine conditions most favorable for conducting experimental research on the synthesis of KPO_3 and $KCaPO_4$. A flow diagram for a plasma unit is presented. Figures 3; references 6 (Russian). [353-12765]

UDC 678.5:661.183.123.2:547.455.623:547.415.632

SEPARATION OF GLUCOSE AND FRUCTOSE USING SULFOCATIONITES OF VARYING DEGREES OF CROSSLINKING

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 85 pp 36-37

KUPTSEVICH, Yu. Ye., STALNAYA, I. D., PRONIN, A. Ya., NAKHAPTEYAN, L. A. and LARIONOV, O. G.

[Abstract] Fructose, a low caloric sugar substitute, may be obtained from invert syrup by chromatographic separation with an ion exchange resin, but the efficiency of the process depends greatly on the degree of crosslinking in the ionite. A study was made of the effect of crosslinking in KU-2 sulfocationite (styrene-divinylbenzene copolymer) on glucose-fructose separation. The crosslinking agent (divinylbenzene) was varied from 2 to 8%. Experiments conducted in a 1.5 X 33 cm column and 0.25 - 0.50 mm particle size at 20°C, 1% bulk loading and 0.8 ml/min flow rate show that optimum fructose-glucose separation takes place at 4.5 - 5% divinylbenzene content. Steric factors also play a significant role in the adsorption process. Figures 2.
[300-12765]

UDC 630*863:546.226-325

CONVERSION OF PLANT RAW MATERIALS INTO FEED YEASTS AND FEED CARBOHYDRATE

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST in Russian No 5, 1985 pp 6-8

KOROL'KOV, I. I., LEVANOVA, V. P., LIVANOVA, R. P., YABLOCHKINA, S. P., BALASHEVICH, I. I., BYKOV, V. A., VAAKS*, V. R., DOSINA*, A. G. and LIS*, A. G., All-Union Scientific Research Institute of Hydrolysis;
*Rechitsa Experimental Industrial Hydrolytic Plant

[Abstract] Improvements were made in the technology of feed yeast production and conversion of raw plant materials into carbohydrate feed by the introduction of greater hydrolytic efficiency and control of losses due to lignin wastes. The basic scheme consists of a two-stage approach to

hydrolysis. In the first step, percolation hydrolysis of hemicellulose is conducted at 146-150°C. In the second stage, cellolignin, after removal of the hemicellulose hydrolysate, is subjected to hydrolysis at 170-180°C for 15-30 min with 0.5% sulfuric acid prior to ejection. Under these conditions there is less loss of sugar due to decomposition, heating requirements are decreased, and the residual cellolignin can be converted to carbohydrates that are useful as feed. The latter contains, after further purification and neutralization, ca. 9% sugar, 46% cellulose, 5% ammonium sulfate and organic acids, and 38% lignin. Toxicity testing on animals has not demonstrated any adverse effects.
[366-12172]

FREE RADICALS

UDC 543.51:541.515:541.49:546.73:546.56

MASS SPECTRA OF METAL COMPLEXES WITH STABLE FREE IMIDAZOLINE RADICALS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 7, Jul 85 (manuscript received 27 Sep 84) pp 1664-1667

INDRICHAN, K. M., LARIONOV, S. V., GEREBELEU, N. V. and OVCHANRENKO, V. I.,
Institute of Chemistry, Moldavian SSR Academy of Sciences, Kishinev;
Institute of Inorganic Chemistry, Siberian Department, USSR Academy of
Sciences, Novosibirsk

[Abstract] The first reported studies were conducted on the mass spectra of complexes formed between Cu(II), Co(II) and Zn with paramagnetic enaminoketones. The mass spectra of the complexes of copper, cobalt and zinc differed little, indicating similarities in fragmentation on electron impact. It appears that ionization of these coordination compounds results in the loss of an unpaired ligand electron, while the chief factor contributing to the fragmentation of complexes with stable free imidazoline radicals is the localization of the positive charge and of the radical center on the M^+ in the ligand. The degree of oxidation of the central atom was without a significant effect on these processes. A unique feature of these complexes was the lack of spectral lines for the $[M-L]^+$ ion. Introduction of the CF_3 group into the complexes led to some new fragmentation pathways, but on the whole the fragmentation was little affected by the R radical.

References 11: 8 Russian, 3 Western.

[350-12172]

INORGANIC COMPOUNDS

UDC 621.793.3:669.24'781'873'849

CHEMICAL DEPOSITION OF Ni-B-Tl-Re PLATINGS

Vilnius TRUDY AKADEMII NAUK LITOVSKOY SSR: SERIYA B in Russian Vol 3, 1985 (manuscript received 29 Mar 84) pp 3-8

ZHELIS, Kh. P. and ZHELENE, A. Yu., Institute of Chemistry and Chemical Technology, LiSSR Academy of Sciences

[Abstract] Nickel coatings containing rhenium are hard, corrosion-resistant and have a high melting point (1700°C). However, the plating rate is slow (10 mkm/hr) and the plating conditions are not well known. The present work was undertaken to determine ways to speed up the plating process, the possibility of a correcting solution and the distribution of components throughout the thickness of the coating. Plating was applied to glass and nickel by conventional means, thickness was determined by electron microscope and composition by analysis. A correcting solution containing (% by wt) of: B - 1.5, Tl - 2, and Re - 20-22 was developed. Rhenium is included in the plating in the $\text{Re}(\text{OH})_4(\text{ReO}_2 \cdot 2\text{H}_2\text{O})$ form. The Re and Tl content in the plating increases with thickness. This is apparently due to the accumulation of intermediate BH_4^- oxidation products which facilitate reduction of ReO_4^- and Tl^+ . Figure 1; references 9 (Russian). [354-12765]

UDC 620.193:669.587

CORROSION RESISTANCE OF NON-CHROMATED Zn COATINGS IN INDUSTRIAL ATMOSPHERE

Vilnius TRUDY AKADEMII NAUK LITOVSKOY SSR: SERIYA B in Russian Vol 3, 1985 (manuscript received 14 Mar 84) pp 9-14

PREYKSHAYTE, R. K. and LEPUONENE, G. P., Institute of Chemistry and Chemical Technology, LiSSR Academy of Sciences

[Abstract] A study under industrial municipal conditions was made of the corrosion resistance of non-passivated zinc coatings and the effects of the nature of the electrolyte and meteorological factors on the corrosion rate of the coatings. Strips of steel-10 were galvanized with zinc to various

thicknesses by methods developed at the Institute of Chemistry and Chemical Technology, LiSSR Academy of Sciences. The test strips were exposed from 1977 to 1983 on the roof of the institute (Vilnius, 48 Pozhelos Street) near ventilation intakes, and corrosion was determined visually and by weight loss. It was found that corrosion resistance is a function of the electrolyte composition, meteorological factors and thickness of the coating. Corrosion of non-passivated zinc commenced after 2-2.5 years. The lifetime of the coatings lasted 3-6 years, depending on their thickness. The most stable coatings were made with a cyanide electrolyte. Figures 2; references 7: 6 Russian, 1 Western.
[354-12765]

UDC 621.315.592.4:546.19

THERMAL OXIDATION OF ARSENIC-ION-IMPLANTED SILICON IN WATER VAPOR

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 7, Jul 85
(manuscript received 18 Jul 83) pp 1604-1607

MITTOVA, I. Ya., YEMEL'YANENKO, S. I. and MEDVEDEV, N. M., Voronezh State University imeni Komsomol

[Abstract] Data were collected on the kinetics and activation energies of thermal oxidation of silicon ion-implanted with As^+ in a H_2O (vapor) + O_2 system over a temperature range of 900 to 1200°C. The silicon membranes were irradiated on one side with 60 keV As ions with doses ranging from 100 to 10,000 $\mu C/cm^2$. The greatest increase in the rate of oxidation was observed for samples implanted with As^+ when the dose was raised from 0 to 1000-2000 $\mu C/cm^2$, with the rate thereafter remaining unchanged or even showing a slight decrease. Analysis of the kinetic oxidation plots showed that at the higher temperatures the process is described by parabolic equations, indicating a diffusion limited process, whereas at lower temperatures (900-950°C) a linear-parabolic relationship prevailed. The energies of activation for the oxidation process for the unimplanted and implanted silicon samples were, respectively, 88 and 71 kJ/mole, as calculated by the Deal and Grove equation [Deal, BE, and Grove, AS, J. Appl. Phys., 36(12):3770, 1965], demonstrating that As^+ facilitates oxidation. Figures 3; references 7: 4 Russian, 3 Western.
[356-12172]

THERMODYNAMICS OF ARGON DISSOLUTION IN AQUEOUS TETRAALKYLAMMONIUM HALIDES

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 7, Jul 85
(manuscript received 18 Jul 83) pp 1608-1610

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[Abstract] Tabulated and graphical data are presented on the dissolution of argon in aqueous tetraalkylammonium halides in the temperature range of 273 to 298°K. For all the solutions and temperatures tested, the process of argon solution was exothermic, with maximum exothermicity prevailing at $x = 5 \times 10^{-4}$ mole fraction in the 272-288°K range. At all solution compositions and temperatures the entropy component of Gibb's free energy counteracted argon dissolution, reaching a maximum effect at $x = 5 \times 10^{-4}$ mole fraction and 273-288°K. Differences in the thermodynamic parameters observed with the individual halides were ascribed to different effects of the halide ions on water structure. Figures 3; references 5 (Russian).
[356-12172]

ELASTIC CHARACTERISTICS OF REACTIVE HYDROCARBON GLASSES AT LOW TEMPERATURES

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 7, Jul 85
(manuscript received 10 Aug 83) pp 1755-1758

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[Abstract] Acoustic measurements were made on hydrocarbon glasses to assess the factors affecting the rate of photochlorination in terms of mechanical properties of these compounds. Determinations of the elastic characteristics were based on sound wave propagation, thermal coefficients of linear expansion and diffraction indices of methylcyclohexane, butyl chloride, 2,3-dimethylbutane, methylcyclopentane and 2-methylpentane. Determination of the elastic coefficients at 70°K and of other parameters showed the utility of using acoustic methods in studies on low temperature solid-phase reactions. Further progress in this direction will depend on better understanding of glass-phase structure and the effects of the structural features on reactivity, and of the mechanism(s) by which elastic sound waves accelerate low temperature reactions. Figures 2; references 14: 12 Russian, 2 Western.
[356-12172]

UDC 541.183.123:547.458.81

EFFECT OF WATER CONTENT AND SPECIFIC SURFACE ON EXCHANGE CAPACITY OF
CELLULOSE ANIONITE

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 58, No 7, Jul 85
(manuscript received 1 Feb 84) pp 1552-1555

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State University imeni I. I. Mechnikov

[Abstract] The specific features of fibrous anion exchange cellulose materials make them suitable for sanitary gas purification, especially as individual respirators to protect the wearer from acidic gases and vapors. In the Soviet Union, highly basic cellulose anionite TSM-A2ND used for this purpose is prepared in nonwoven form from TsM-A2 fiber, which is obtained by graft polymerization of cellulose (viscose staple fiber) to 2-methyl-5-vinylpyridine followed by alkylation with epichlorohydrin. Gas adsorption is known to increase with rising water content and a study was made of the effects of pore structure and type of water bond with TsM-A2 fiber on its exchange capacity. Fiber samples containing 15-63% grafted polymethyl-vinylpyridine were used. The study shows that although TsM-A2 has a high water capacity and a highly developed surface, its exchange capacity is relatively low. Evidently, the effectiveness of similar adsorbents may be increased by changing their physical structure and thereby increasing access to ionogenic groups. Figures 3; references 11 (Russian).
[351-12765]

EFFECTS OF LOW-FREQUENCY ALTERNATING ELECTRIC FIELDS ON ION REDISTRIBUTION
IN ION-EXCHANGE SYSTEMS

Moscow ELEKTROKHIMIYA in Russian Vol 21, No 7, Jul 85

(manuscript received 12 Sep 83) pp 912-914

GNUSIN, N. P., ALEKSEYEVA, S. L. and ZABOLOTSKIY, V. I., Kuban State
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[Abstract] To complement data on the effects of a permanent electric field on ion exchange resin systems, similar studies were conducted on the effects exhibited by alternating electric fields with periods (T) ranging from 2 to 8400 sec. Exposure of cation exchange resin KU-2 (0.5 - 1.0 mm granules) in Ca and Na perchlorate solution (10^{-2} g-equiv/liter perchlorate, 0.2 g-equiv Ca ion fraction) resulted in an initial displacement of Ca ion on the resin by Na ions, with the net effect that the concentration of Ca ions in the solution increased and that of the Na ions decreased. Within about 20 min equilibrium was re-established between the resin and eluate concentrations of Ca^{++} in the case of $T < 80$ sec. With alternating fields with higher periods ($T > 80$ sec) longer times were required for the re-establishment of steady-states, with the increase exceeding an order of magnitude in going from $T = 14$ sec to $T = 1200$ sec. At $T \leq 14$ there was virtually no redistribution of the Ca and Na ions. The effects of the alternating electric fields were ascribed to changes in ionic fluxes and grain polarization, with the electric fields favoring an efflux of the Na ions from the solution into the resin, and of Ca ions in the reverse direction. Figures 3; references 9 (Russian).
[365-12172]

ORGANOMETALLIC COMPOUNDS

UDC 541.546.56

ANALYSIS OF INDIVIDUAL ABSORPTION BANDS OF Co(II)-AMINO ACID COMPLEXES

Dushanbe DOKLADY AKADEMII NAUK TADZHIKSKOY SSR in Russian Vol 28, No 3,
Mar 85 (manuscript received 26 Dec 84) pp 155-157

ISMAILOV, D. I. and GORNOSTAL', A. A., Tajik State Medical Institute
imeni Abuali Ibn Sino [Avicenna]

[Abstract] An analysis was conducted on the state of the central atom in Co(II)-amino acid complexes at pH 9-10. At high pH values chelate complexes are formed with coordination of all the functional groups that are potentially capable of forming donor-acceptor bonds with metal ions. Evaluation of the spectra obtained with Co(II) complexes formed with histidine, glycine and aspartic acid in borate buffers indicated that the low ϵ values can be attributed to $d \rightarrow d$ transitions. The slightly greater intensity of the complexes with the amino acids in relation to $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$ are ascribed to moderate distortion. The relatively high UV intensity of the histidine complexes was ascribed to charge transfer from the imidazole ring to the d orbitals of Co. Figures 2; references 4: 2 Russian, 2 Western.
[370-12172]

UDC 546.264 + 661.643 + 546.31

THERMODYNAMIC AND THERMAL ANALYSIS OF REACTIONS BETWEEN ALKALI METAL CARBONATES AND ARSENIC (V) OXIDE

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA
in Russian No 4, 1985 (manuscript received 15 Mar 84) pp 13-19

KASENOV, B. K., Chemico-Metallurgical Institute, Karaganda

[Abstract] Although used to derive arsenic from its ores and concentrates, thermodynamic data on reactions of sodium carbonate with arsenates is lacking. In the present work a thermodynamic analysis of the reactions of carbonates of alkali metals (except sodium) with arsenic (V) oxides was

carried out. Meta-arsenate formation is shown to be the most advantageous from an energy standpoint. The data also show that a 2.5- to 3-fold savings in sodium carbonate consumption is possible in copper refining by fire, alkaline refining of lead and in the production of antimony. Solid phase reaction of lithium, rubidium and cesium carbonates with arsenic (V) oxides were studied employing thermal and X-ray methods. Figures 5; references 26: 26 Russian, 1 Western.
[353-12765]

ORGANOPHOSPHORUS COMPOUNDS

UDC 547.794:543.422

REACTION OF DIAZAPHOSPHOLES WITH CARBONYL COMPOUNDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 55, No 7, Jul 85
(manuscript received 19 Jun 84) pp 1464-1471

ARBUZOV, B. A., DIANOVA, E. N., ZABOTINA, Ye. Ya., YEFREMOV, Yu. Ya.,
KORSHUNOV, R. L. and MUSIN, R. Z., Scientific Research Chemical Institute
imeni A. M. Butlerov, Kazan State University imeni V. I. Ul'yanov-Lenin

[Abstract] IR and ^{31}P and ^1H NMR spectroscopies were employed to monitor the reactions of 5-methyl-2-phenyl-1,2,3-diazaphosphole (I) with selected mono- and dicarbonyl compounds, which demonstrated that I displayed greater reactivity in these reactions than did 2-acetyl-5-methyl-1,2,3-diazaphosphole. Specific reactions involved I and cyclohexanone, cyclohexane-1,2-dione, cyclopentanone and absolute acetone. The spectroscopic data demonstrated that I reacts with the carbonyl compounds according to two mechanisms, forming addition products with the P=C bond and the P atom. References 8: 3 Russian, 5 Western.
[349-12172]

UDC 547.794:543.422

REACTION OF DIAZAPHOSPHOLES WITH DIAZO COMPOUNDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 55, No 7, Jul 85
(manuscript received 3 Jul 84) pp 1471-1475

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[Abstract] IR and PMR spectroscopic analyses were carried out on the reaction of diazaphospholes with diethylphosphonodiazomethane (I), 1-diazo-2-methylpropane (II) or 1-diazo-2,2-dimethylpropane (III) to assess the effects of electronic and steric factors on the course of the reactions. Reaction of 2-acetyl-5-methyl-1,2,3-diazaphosphole with I proceeds readily

at room temperature in absolute ether with the formation of crystalline 2-acetyl-8-diethylphosphono-4-methyl-1-phospha-2,3,6,7-tetraazobicyclo[3,3,0]-octa-3,7-diene, without nitrogen formation. The compounds II and III react with 5-methyl-2-phenyl-1,2,3-diazaphosphole at low temperatures (-80 to -30°C) in absolute ether with the formation of crystalline tricyclic compounds and 4-substituted diazaphospholes. References 5: 2 Russian, 3 Western. [349-12172]

UDC 547.794.2'118

SYNTHESIS AND REACTIVITY OF P(II) CYCLIC OLIGOMER DERIVATIVES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 55, No 7, Jul 85
(manuscript received 9 Jul 84) pp 1475-1479

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[Abstract] ^{31}P NMR studies were conducted on the reactivity and synthesis of P(II) cyclic oligomers, commencing with the synthesis of 2-chloro-4,5-benzo-1,3,2-oxazaphospholane (I) by the dropwise addition of phosphorus trichloride to a mixture of o-aminophenol and triethylamine in benzene. The reaction was carried out at 10-15°C, forming I in a yield of 98%. 2-Chloro-4,5-benzo-1,3,2-thiazaphospholane was synthesized in an analogous manner to I. The 2-chloro-4,5-benzo-1,3,2-oxaza(thiaza)phospholanes underwent dehydrochlorination on reaction with bases, yielding 4,5-benzo-1,3,2-azaheterophosphole oligomers. The latter readily reacted with the acid halides of P (III), carboxylic acids and halogenated silanes to give, respectively N-phosphorylated, N-acetylated, and N-silylated oxazaphospholanes. References 8: 6 Russian, 2 Western. [349-12172]

UDC 547.341

REACTIVITY OF ISOBUTENYLDICHLOROPHOSPHINE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 55, No 7, Jul 85
(manuscript received 3 May 84) pp 1479-1484

PUDOVIK, A. N., KHAYLOVA, N. A., SHAGIDULLIN, R. R., CHERNOV, A. N. and KHAYRULLIN, V. K., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan Branch, USSR Academy of Sciences

[Abstract] Conditions are described for the preparation of isobutenyldichlorophosphine (I) by the reaction of isobutylene with phosphorus pentachloride to give a pasty mass which, on heating at 65°C with dropwise

addition of methyldichlorophosphite, yielded I. I reacted with 2 moles of ethanol in the presence of 2 moles of triethylamine to give diethyl isobutenylphosphonous acid ester, which reacts with ethyl iodide by the Arbuzov mechanism to yield the ethyl ester of ethylisobutenylphosphonic acid following heating in a sealed ampule (4 h at 100°C). Acrylic acid reacts with I (4 h at 40°C) to give isobutenyl(beta-chlorocarbonylethyl)phosphonic acid chloride (II). II was found to react with butylamine and triethylamine (room temperature, 4 h) to yield 2-isobutenyl-1-butyl-2,5-dioxo-1,2-azaphospholane (III). The compound III reacted with absolute ethanol with an opening of the ring at the P-N bond with the formation of the ethyl ester of isobutenyl(beta-butylaminocarbonylethyl)phosphonic acid. References 12: 10 Russian, 2 Western.
[349-12172]

UDC 547.241:66.892(088.8)

REACTIONS OF α,α,ω -TRIHYDROPERFLUOROALKANOLS WITH PHOSPHORUS TRICHLORIDE IN METHANOL

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 55, No 7, Jul 85
(manuscript received 5 May 84) pp 1485-1487

MAKAROV, A. M., KHAYKIS, Ye. M. and RODYGIN, A. S., Natural Sciences Institute, Perm State University imeni A. M. Gorky

[Abstract] Conditions are described for the reaction of α,α,ω -trihydroperfluoroalkanols with phosphorus trichloride and methanol to devise a method for the direct synthesis of dialkyl phosphites with perfluoro groups. The technique was successfully employed to secure the synthesis of bis(1,1,5-trihydroperfluoroamyl)phosphite and bis(1,1,7-trihydroperfluoroheptyl)phosphite. The side products included previously undescribed asymmetric methyl(1,1,3-trihydroperfluoropropyl)phosphite, methyl (1,1,5-trihydroperfluoroamyl)phosphite, and methyl(1,1,7-trihydroperfluoroheptyl)phosphite. References 4 (Russian).
[349-12172]

REACTION OF DIALKOXYPHOSPHORYLISOCYANATES WITH CHLORALUREA

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 55, No 7, Jul 85
(manuscript received 15 May 84) pp 1487-1489

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[Abstract] Spectroscopic studies were conducted on the reaction of dialkoxyphosphoryl isocyanates with chloralurea, which proceeds in the absence of a catalyst with equivalent reactant ratios. The initial steps involve formation of N-phosphorylated carbamates which undergo partial decarboxylation at 20-40°C to the amines. CO₂ elimination is accelerated by heating. The reactions under consideration involved the formation of dipropyl[(1-ureido-2,2,2-trichloroethoxycarbonyl)amido]phosphate by the reaction of chloralurea with dipropoxyphosphoryl isocyanate in dioxane at 20-38°C, and its subsequent decarboxylation to dipropyl(1-ureido-2,2,2-trichloroethyl)amidophosphate. References 3: 1 Russian, 2 Western.
[349-12172]

UDC 547.241+547.412.92

NITROGENOUS DERIVATIVES OF BIS(HEPTAFLUOROPROPYL)PHOSPHINIC ACID

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 55, No 7, Jul 85
(manuscript received 10 Jul 84) pp 1586-1590

PAVLENKO, N. V., MATYUSHECHEVA, G. I., SEMENIY, V. Ya. and
YAGUPOL'SKIY, L. M.

[Abstract] Interest in nitrogenous derivatives of bis(heptafluoropropyl)-phosphinic acid led to studies which demonstrated that the acid chloride reacts with anhydrous ammonia at -78°C to yield the amide form in 50-60% yield. In excess ammonia the amido-imide derivative is formed at -30°C. Prolonged reaction of the phosphinic acid amide with ammonia leads to removal of the heptafluoropropyl radical and formation of heptafluoropropylphosphonate diamine. The N,N-dichloroamide of bis(heptafluoropropyl)phosphinic acid is a highly unstable derivative which on storage, heating or irradiation is transformed into tetrakis(heptafluoropropyl)diphosphine dioxide, a step involving the cleavage of the P-N bond. Imide synthesis of bis(heptafluoropropyl)phosphinic acid is achieved by reaction of the acid chloride and the amide of the acid at 0°C in ether in the presence of catalytic quantities of triethylamine. References 10: 9 Russian, 1 Western.
[349-12172]

ELECTRON DONOR AND ACCEPTOR FUNCTIONS OF PHYSIOLOGICALLY ACTIVE AND MODEL COMPOUNDS. PART 6. PROTON ACCEPTOR AND ELECTRON DONOR FUNCTION OF ARYLAZOPHOSPHONATES

Leningrad ZHURNAL OBSHCHEY KHIMII Vol 55, No 7, Jul 85
(manuscript received 11 Jun 84) pp 1590-1593

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[Abstract] The basicity and nucleophilicity of arylazophosphonates was assessed on the basis of their enthalpies of H-complex formation with phenol and electron donor functions. The spread of enthalpies (ca. -13 to -23 kJ/mole) demonstrated that the arylazophosphonates form a fairly strong hydrogen bond, depending on the substituent on the aryl fragment of the P atom. The value of $-\Delta H$ decreased with the introduction of electronegative substituents into the aromatic ring, due to a decrease in the electron density on the phosphoryl oxygen. Studies with diethyl-p-dimethylamino-phenylazophosphonate indicated that protonation involves the phosphoryl oxygen, as is the case with other azophosphonates, rather than the amino group. On the basis of basicity determinations the arylazophosphonates can be expected to exhibit the same degree of solvation as pyridine or dimethylformamide when used as solvents, but less than hexamethyltriamidophosphate. Figures 1; references 14: 10 Russian, 4 Western.
[349-12172]

MOLECULAR AND CRYSTALLINE STRUCTURE OF 1-O-[BIS(N-DIETHYLAMIDO)-THIONEPHOSPHATE]-2,4;3,5-BIS-O-(N-DIETHYLAMIDOTHIONEPHOSPHATE)RIBITOL (I) ($C_{31}H_{47}N_4O_5P_3S_3$)

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian
No 7, Jul 85 (manuscript received 26 Mar 84) pp 1550-1557

LITVINOV, I. A., STRUCHKOV, Yu. T., ARBUZOV, B. A., MAKAROVA, N. A. and MUKMENEV, E. T., Institute of Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences, Moscow; Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan Branch, USSR Academy of Sciences

[Abstract] X-ray structural analysis, using the MULTAN program, was employed to identify I among the products obtained by the successive reaction of ribitol with phosphorus trichloride, diethylamine and sulfur. Analysis of the bond lengths, valence angles, and atomic coordinates demonstrated that in I the 6-membered heterocyclic rings in the chair conformation form a

condensed 2,4,7,9-tetraoxa-3,8-diphospha-trans-bicyclo[4.4.0]decane system, in which the substituents are disposed in an equatorial orientation. The detection of I indicates that the reaction of ribitol with excess PCl_3 , in addition to yielding the predominant product 3-O-(dichlorophosphite)-1,2;4,5-bis-O-(chlorophosphite)ribitol, containing 5-membered chlorophosphite rings, also forms the isomeric 1-O-(dichlorophosphite)-2,4;3,5-bis-O-(chlorophosphite)ribitol with 6-membered chlorophosphite rings. Figures 2; references 12: 8 Russian, 4 Western.
[350-12172]

PETROLEUM PROCESSING TECHNOLOGY

SARSENBAY GAS WELL ACHIEVES RECORD FLOW

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 25 May 85 p 1

[Article by A. Seroshtanov, Mangyshlak, Kazakh SSR: "Record Well"]

[Text] The average daily yield from the richest gas sources of the Mangyshlak deposit has been exceeded by three to five times this week by a well drilled in the Sarsenbay area. This success was brought about by drilling pioneers from the Mangyshlak Exploratory Drilling Administration.

In the opinion of experts the generous Sarsenbay area will become a major supplier of raw material for the Kazakh Gas Refinery and the Shevchenko Plastics Plant in the not-too-distant future. Presence of nearby underground pipelines connecting to other gas mains will, doubtlessly, promote its fastest possible attainment of operational status.

11004
CSO: 1841/320

PLANT WASTES AS FUEL SOURCE

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 4 Jul 85 p 4

[Article by V. Lagovskiy: "Gasoline Growing in the Fields"]

[Text] Today, the work of both power engineering and transportation is based on fossil fuels. But with every year, it is becoming more difficult to supply them to consumers. Moreover the reserves of oil, coal and gas are far from unlimited. Scientists are persistently seeking reserves among the so-called renewable energy sources, even seriously considering, as a fuel for the future, biomass--wood, leaves, grass, and in a word, all kinds of plant materials.

"Judge for yourself," said Belorussian SSR Academy of Sciences Academician Ya. Paushkin, an associate of the Institute of Fossil Fuels. "Each year the world increment of just the biomass of the forests is about 50 billion tons. Even if this biomass were to simply be burned in boilers, energy equivalent to 20 billion tons of oil would be generated. But this path would be too wasteful and, moreover, it would not solve the problem of automotive fuel: To put it bluntly, modern vehicles are not adapted for firewood. Alcohols, which can be easily obtained from plant materials, cannot be used in motor vehicle engines without their modification. Therefore we propose traveling a different path--one that is perhaps more complex, but one which will doubtlessly be advantageous, that of converting biomass into gasoline."

I visited a small laboratory device, in the womb of which this remarkable transformation occurs.

"There is nothing remarkable going on here," explained a scientist. "It's just an ordinary chemical reaction--carbohydrates are being transformed into hydrocarbons."

Of course, it is not all that simple. It was not until they selected the right temperature, pressure, gas medium and special catalysts that the scientists were able to "squeeze" up to 30 percent gasoline, gas-oil and even fuel oil--the main fuel of most boiler houses and electric power plants--from a mixture of very ordinary wood chips and water. Moreover it was found that the crude gasoline contains so many valuable hydrocarbons that it can also be used in petrochemistry to produce polymers.

In a word, the benefits were obvious, but I was still unsettled by a certain question: Would the possibility of obtaining such readily available gasoline in large amounts not lead to catastrophic reduction of the size of forests?

"There is no need to cut down trees just for gasoline," Ya. Paushkin retorted, and taking a sheet of paper, he said to me: "Let's figure it out. Today the sawmills lose up to 40 percent of their trees: The bark, chips, crown and branches are not utilized, and they are lost to us. Add to this the sawdust, and the unutilized remains of agricultural crops--for example cotton stems that are not put to use, and the leaves that are burned in the millions of tons in the fall. Or consider the wastes of pulp-and-paper industry, which do nothing more than mercilessly contaminate the environment for the moment. These raw materials are enough to produce over 100 million tons of liquid fuel per year! All we need to do is learn how to collect these materials and process them."

Small mobile oil synthesis devices presently being created will provide significant assistance in this area. They operate off of fuel which they themselves produce, expending only 1 calorie for every 4 that are produced.

"Fuel from plants could solve many problems," Ya. Paushkin said persuasively, "including ecological."

Recent experiments by scientists produced unexpected results: It turns out that even urban trash is entirely suitable for gasoline production.

11004
CSO: 1841/320

DIESEL ENGINES TO RUN ON GAS-CONDENSATE FUEL

Tashkent PRAVDA VOSTOKA in Russian 14 Jun 85 p 3

[Article by correspondent Yu. Kruzhilin: "Fuel for Diesel Engines"]

[Text] A new kind of motor fuel created in Uzbekistan has acquired its "rights of citizenship." The Tashkent Institute of Motor Highways received a message from the USSR Gosstandart granting permission for use of gas-condensate fuel at Central Asian oil fields.

This means that from this day forward, diesel trucks and buses servicing oil field workers and the powerful engines that place drilling rigs into motion can be filled with fuel acquired from the deposits.

Many years of work by scientists of the TADI [Tashkent Institute of Motor Highways] and by the republic's automotive engineers have come to a successful conclusion. The innovation promises an impact which is difficult to estimate today.

What we are talking about is the use of gas condensate--a combustible liquid close in composition to oil. Condensate comes to the surface from wells simultaneously with gas, and the bulk of it is burned on the spot. Of course, in some places it is collected and shipped to oil refineries, where it is distilled to obtain standard diesel fuel.

But there is never enough fuel. This shortage is precisely the principal obstacle to making wide use of diesel engines. And yet, such engines are unusually economical. They consume 40 percent less fuel. The fuel itself is by far cheaper than gasoline. An extremely important consideration--especially in large cities--is that a diesel engine discharges 40 percent less toxic substances into the atmosphere.

By introducing diesel engines we will release hundreds of thousands and millions of tons of an extremely valuable raw material--oil--for other uses. But as it turns out, we first have to build new oil refineries. However, it has now become clear that the fuel reserves for diesel engines can be replenished without oil refineries.

In cooperation with scientists of the Moscow All-Union Scientific Research Institute of Natural Gas, the All-Union Scientific Research Institute of Oil Refining Industry and the Central Scientific Research Institute of Motor

Vehicles and Motor Vehicle Engines and with associates from Chelyabinsk, Omsk, Ukhta and other cities, specialists of the TADI and the Uzavtotranstekhnika Association demonstrated that when a diesel engine is filled with gas condensate, it will operate normally.

In practice, in order to avoid additional engine adjustment a certain quantity of diesel fuel must be added to the condensate. Precisely how much is determined individually at each deposit. A special theory was derived in order to correctly calculate the proportions of the mixture.

A wide-scale experiment was carried out for over a year at five motor vehicle enterprises in Tashkent, Chirchik and Bukhara in order to test the new fuel. MAZ, KamAZ, Ikarus and KrAZ vehicles consumed a hundred tons less fuel during this period than did "control" motor vehicles. The engine life of these vehicles increased as well. Discharge of toxic substances, especially carcinogens, was halved.

And these are far from all of the advantages. We should add here the output capacities of oil refining industry that have been freed for other purposes. And one more: Since vehicles at the oil fields will be fueled with condensate, less refinery fuel would have to be delivered there. Thus there is a savings in transportation as well.

And so, the benefits are obvious. Has a green light been given to gas-condensate fuel?

"Not quite," said E. P'yadichev, the project chief and a docent at the TADI. "First of all, we need to hasten construction of a gas-condensate fuel mixing facility at least at the largest gas field in Uzbekistan--in Shurtan. And still better, this should be done at the deposits in Gazli, Mubarek, Urta bulak, Dengizkul-Khauzak and others. Second, we need to solve a number of organizational problems that are hindering introduction."

The scientist explained: After all, gas producers now have to play a new, unfamiliar role--suppliers of liquid fuel. They are not ready for this. Primary purification of condensate must be organized at the oil fields, and many functions that are now being carried out by enterprises of the Ministry of Petrochemical Industry must be assimilated.

The railroads are not ready; nor are services of the State Committee for Supply of Petroleum Products. The fleet of tank cars they allocate for shipment of the gas condensate must be washed clean, so as not to contaminate condensate obtained from the wells.

These obstacles, TADI scientists believe, must be eliminated right now, during drafting of the state plan for the 12th Five-Year Plan.

There is one other surprise that confronted the TADI just recently. It was found that fuel similar to gas-condensate fuel can not only be extracted but also produced at refineries using the same raw materials and the same equipment, without any capital outlays.

"But what is this all needed for?"

"Consider the ecological impact! Consider that the sphere of use of gas-condensate fuel is widening: We will start using it in the cities (this would be entirely possible if we got the oil refineries to join the effort). Then, on converting, say, 40,000 diesel motor vehicles in Tashkent to the new field, we will halve the amount of toxic substances they discharge. According to estimates this measure will result in an annual economic impact of 87 rubles per vehicle, for a total of about 3.5 million rubles. Why? Mainly owing to improvement of the people's health and reduction of outlays on air purification. I think that the Fergananefteorgsintez Association, with which we are closely cooperating, can already provide at least the diesel motor pool of Tashkent with the new fuel. There are no technical obstacles to this. And the benefits are sizable, as you yourself can see."

Each year we burn up to 8 million tons of extra gasoline because of the delays in converting the country's motor vehicle fleet to diesel engines. This fact was brought out at a conference on accelerating scientific-technical progress conducted in the CPSU Central Committee. Introduction of diesel engines will mean placing one of our economy's largest reserves into operation. Scientists and engineers of Tashkent have made a substantial contribution to solving the problem. Now they need our support.

11004
CSO: 1841/320

UDC 665.61.033.28:542.943.5

STRUCTURE OF DESTRUCTION PRODUCTS OF ASPHALTENES

Dushanbe DOKLADY AKADEMII NAUK TADZHIKSKOY SSR in Russian Vol 28, No 4, Apr 85
(manuscript received 1 Feb 85) pp 216-218

YELISEYEV, V. S. and NUMANOV, I. U., academician, Tajik SSR Academy of Sciences Institute of Chemistry imeni V. I. Nikitin, TaSSR AS.

[Abstract] An analysis was conducted on the products obtained by destruction of asphaltene in benzene with a Lewis acid. One product fraction was found to contain, on the basis of IR and PMR spectroscopies, substituted benzenes which accounted for ca. 80% of the constituents. These consisted of compounds with 1 to three benzene rings and C₁-C₃ alkyl groups. The sediment remaining, after the previous fraction was removed with water, was subjected to a similar chemical and spectroscopic analysis, and again showed both alkylaromatic fragments and condensation products containing benzene rings. These observations indicate that asphaltenes may serve as a source of polyfunctional alkylaromatic hydrocarbons. Figures 1; references 6: 3 Russian, 3 Western.
[370-12172]

UDC 697.32.662.75

MOBILE AUTOMATIC HEATING BOILER INSTALLATIONS IN OIL AND GAS PRODUCING REGIONS OF SIBERIA

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNIKA in Russian No 7, 1985 pp 27-28

TERESHCHENKO, V. G. and MAKAROV, A. S., candidates of technical sciences, and GAMZA, S. N., engineer, NIIST [expansion unknown--possibly Sci. Res. Inst. of Sanitary Technology], Kiev

[Abstract] Currently, more than 200 mobile automatic heating boiler installations are functioning in the various regions of the oil and gas producing areas of Siberia, utilizing the local fuels for the production of thermal

energy for domestic and industrial purposes. Many of these installations have been in operation since 1978, with a truly remarkable record of reliability and performance. Special consideration is given to the use of models PAKU-3.72 and PAKU-3.72Zh [PAKU = Peredvyzhnyye Avtomatizirovannyye Kotel'nyye Ustanovki = Mobile Automated Boiler Installations], which are used either in isolation or in combination with permanent heating plants as a supplementary source of heat. Data are tabulated for operating conditions in certain areas, showing fuel requirements, heat production, efficiency under the different conditions, etc. In general, such boilers provide sufficient heat with outside temperatures as low as -55°C . References 3 (Russian). [360-12172]

UDC 665.521.2:665.64

INDIVIDUAL COMPOSITION AND CATALYTIC REFORMING OF GASOLINE FRACTIONS OF CERTAIN KAZAKHSTAN CRUDES

Alma-Ata IZVESTIYA AKADEMII NAUK KHAZAKHSKOY SSR: SERIYA KHIMICHESKAYA in Russian No 4, 1985 (manuscript received 26 Dec 83) pp 33-86

OMARALIYEV, T. O., KALDYGOZOV, Ye. K., YERKEBAYEVA, G. Sh. and PALACHEV, V. P., Kazakh Chemico-Technologic Institute, Chimkent

[Abstract] Results are presented on a study of the individual composition of primary straight-run gasoline fractions ($85-180^{\circ}\text{C}$) of three crudes from a newly discovered West Kazakhstan oil field. Prior to reforming, the primary fraction was hydrofined over alumina-cobalt-molybdenum catalyst to give a hydrogenate with 0.0005% sulfur content. Catalytic reforming was carried out in a large scale laboratory unit under circulating hydrogen-containing gas which was periodically treated with fresh portions of hydrogen from a bottle. The composition of the crudes and the catalyzates were determined by gas chromatography and are presented in a table. References 6 (Russian). [353-12765]

UDC 621.785.6.006

EXPERIENCE IN USING MODIFIED SULFITE LIQUOR AS QUENCHING AGENT

Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 7, Jul 85 p 39

KHARKOV, E. K., engineer

[Abstract] An industrial grade oil used at the "Volgogradneftemash" Production Association for quenching pump parts and hardware becomes overheated at

high production rates, causing much smoke in the work areas. In a joint effort with the Project Design and Engineering Bureau for Chemical Machines to increase output capacity of the furnaces and to improve working conditions, a new quenching fluid consisting of 50% concentrate of sulfite-yeast mash (KSDB) was tried. The high molecular weight of the acid residue from lignosulfonic acid formed during the quenching forms a colloidal system of charged particles which facilitates smooth and rapid removal of the vapor shell from the heated surface of the metal part to the solution. After cooling to the melting point of lignosulfonic acid (300°C), a colloidal film forms on the surface of the parts which prevents direct contact with the liquid and thus evenly slows down subsequent cooling. Sulfuric acid (0.002% by volume) was added to prevent mildew. A three cubic meter vat resulted in 5,400 rubles savings; an increase in output capacity and electrical consumption reduction of 54,000 kw were realized in two furnaces. [344-12765]

UDC 547.241:298+539.194

VIBRATION SPECTRA AND CONFORMATIONS OF POLYMORPHIC MODIFICATIONS OF
DIPHENYLPHOSPHINYL ACETIC ACID HYDRAZIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 55, No 7, Jul 85
(manuscript received 24 Nov 83) pp 1489-1496

REZIMOV, A. B., ALPAROVA, M. V., TARASOVA, R. I., SYRNEVA, L. P.,
MOSKVA, V. V. and RAZUMOV, A. I., Kazan Institute of Chemical Technology
imeni S. M. Kirov

[Abstract] An analysis was conducted on IR and combined light scattering spectra of the hydrazide of diphenylphosphinyl acetic acid (I), a starting compound for a line of promising tranquilizers. Following synthesis, recrystallization of I from ethanol yields a crystalline product (A) with a m.p. of 160°C, which on prolonged storage undergoes transformation into crystal B with a m.p. of 166-167°C. Recrystallization of crystals A from isopropanol also yields crystalline form B. Significant spectral differences were noted between the A and B forms of I both in the region of intramolecular vibrations and in the region of crystalline lattice vibrations (less than 100 cm⁻¹). The data were interpreted to indicate that in glassy samples and in solution (CH₃Cl₃ and CDCl₃, ca. 0.1 M) I exists in the form of two conformations. Crystalline form A represents one of these conformations, and form B the other. This fact accounts for the disappearance of different bands on crystallization of forms A (508 cm⁻¹) and B (490 cm⁻¹) and the pronounced differences in intramolecular vibrations. Figures 5; references 12: 11 Russian, 1 Western.
[349-12172]

SYNTHESIS OF GRAFT COPOLYMERS OF CELLULOSE, CONTAINING QUATERNARY AMMONIUM GROUPS AND STUDY OF THEIR ANTIMICROBIAL PROPERTIES

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 58, No 7, Jul 85
(manuscript received 30 Jan 84) pp 1603-1606

KOLOKOLKINA, N. V., PENENZHIK, M. A., SOLOVSKIY, M. V., PLOTKINA, N. S.,
PANARIN, Ye. F. and VIRNIK, A. D., Moscow Textile Institute imeni A. N. Kosygin;
Institute of High Molecular Weight Compounds, USSR Academy of Sciences

[Abstract] Water-soluble polymers and copolymers containing quaternary ammonium groups have high antimicrobial activity stemming from their membrane-active properties. In the present work, cellulose was graft polymerized to (N-diethyltetradecyl)ammonium ethylmethacrylic iodide and chloride and to (N-trimethyl)ammonium ethylmethacrylic methylsulfate, by known methods. Antimicrobial properties of the synthetic copolymers were compared with those of cellulose materials having the quaternary ammonium groups applied by impregnation from aqueous solutions. The results show that only those materials from which diffusion of a cationic detergent of a polymeric or monomeric nature into a microorganism-charged medium have antimicrobial properties. In these cases where the covalent bond between the cellulose macromolecule and the cationic polyelectrolyte grafted on to it is not ruptured, and the polymer cannot diffuse from the fibrous material, there is no antimicrobial activity. Antimicrobial agents must therefore be joined to materials such as fibers, films, or hydrogels through labile bonds to make them biologically active. References 9 (Russian).
[351-12765]

PHARMACOLOGY OF 2-METHYL-2-(1-METHYL-2-PROPYLTHIO)-ETHYL-4-DIETHYLAMINO-METHOXYMETHYL-1,3-DIOXOLANE (I)

Dushanbe DOKLADY AKADEMII NAUK TADZHIKSKOY SSR in Russian Vol 28, No 2, Feb 85
(manuscript received 19 Oct 84) pp 100-101

GULIN, A. V., SABIROV, S. S. and KHAYDAROV, K. Kh., Tajik State Medical
Institute imeni Abuali Ibn Sino [Avicenna]

[Abstract] The compound I represents a novel dioxolane insoluble in water, but highly soluble in organic solvents. For pharmacological and toxicity testing, a 3.5% solution was prepared from a 10% stock Tween-80 solution. The LD₅₀ in mice studies on i.p. administration was calculated at ca. 375 mg/kg. Evaluation of soporific effects in mice showed the induction of ca. 36.4 min sleep with 200 mg/kg i.p., ca. 56.3 min sleep with 250 mg/kg i.p., and ca. 73.5 min sleep with 300 mg/kg i.p.. Intraperitoneal

administration of I also potentiated hexenal-induced sleep 2.7- to 4.8-fold. Studies on cats demonstrated that 5 mg/kg of I i.v. had no effect on peripheral nerve conduction, but a pronounced hypotensive effect (50-65 mm Hg decrease for 2-3 h). EKG was not affected. 10 mg/kg of I resulted in respiratory arrest, extreme hypotension, and death. The pharmacological effects of I appear to be primarily due to activation of the parasympathetic nervous system. References 4 (Russian).
[370-12172]

PREPOLYMERIZATION CONTROL OF TITANIUM TRICHLORIDE QUALITY IN POLYPROPYLENE PRODUCTION

Moscow PLASTICHESKIYE MASSY in Russian No 7, 1985 pp 5-7

MAYER, E. A., ANTSIBUROV, K. A., BALAKHONOV, Ye. G., NEKHOROSHEV, V. P., CHERNIKOV, V. B. and IVANCHEV, S. S.

[Abstract] In order to define relationships between the primary characteristics of commercial TiCl_3 and its catalytic activity in polypropylene synthesis, a study was made of the effects of methyl methacrylate on TiCl_3 samples showing different activities and stereospecificities in propylene polymerization. The resultant numerical data are summarized in tabular and graph forms, and indicate that the fractional and chemical compositions of TiCl_3 in KI and in KII titanium-chloride-containing catalysts are virtually identical. In addition, the activity and yield of atactic polypropylene produced by methyl methacrylate-modified and unmodified TiCl_3 was dependent on the particle size of the catalyst. With TiCl_3 samples having a particle size of less than $150 \mu\text{m}$ the activities of unmodified KI and KII catalysts increased with an increase in the size of the crystals, although the absolute values for both types differed markedly. Modification with methyl methacrylate resulted in an insignificant loss of TiCl_3 catalytic activity. Nevertheless, the use of TiCl_3 with particle size in the $150\text{--}250 \mu\text{m}$ range showed that methyl methacrylate treatment led to an increase in the activity of the catalyst and in the yield of atactic polypropylene. Figures 1; references 8: 7 Russian, 1 Western.
[362-12172]

UDC 678.82+678-13:547.339.211:5347.538.141.01

RHEOLOGIC AND PHYSICOMECHANICAL PROPERTIES OF POLYSULFONE + ABS PLASTIC
COMPOSITE MATERIALS

Moscow PLASTICHESKIYE MASSY in Russian No 7, 1985 pp 9-10

ARMER, S. S., KULACHINSKAYA, O. B., SHCHUPAK, Ye. N., MIRONOV, N. A.,
REYTBURD, L. I. and BOLOTINA, L. M.

[Abstract] An analysis was conducted on the rheologic and physicomechanical characteristics of composite materials made from combination of polysulfone and 10-95% ABS plastics. The data are summarized in graph and tabular forms, and indicate that the fluidity of composites with up to 20% ABS remained unaltered. Peak fluidity was seen with samples containing 90% ABS. Electron microscopy of the various samples demonstrated that, with an increase in the concentration of ABS, polysulfone is sequestered in the form of isolated globules within the less viscous ABS matrix. Results of determination of other characteristics (stretch resistance, flexural modulus of elasticity, etc.) were also consonant with the impression that the optimal concentration of ABS should be within the 40-50% range for materials with optimal fabrication characteristics. Figures 1; references 7: 3 Russian, 4 Western. [362-12172]

UDC 678.674.4.01:547.52

PROPERTIES OF AROMATIC UNSATURATED POLYESTERS BASED ON 1,1-DICHLORO-2,2-DI(p-CARBOXYPHENYL)ETHYLENE DICHLOROANHYDRIDE

Moscow PLASTICHESKIYE MASSY in Russian No 7, 1985 p 22

KEKHARSAYEVA, E. R., MIKITAYEV, A. K., SHUSTOV, G. B., KHARAYEV, A. M. and DOROFYEV, V. T.

[Abstract] A series of polyesters were synthesized to test suitability of such aromatic unsaturated films and coatings for service at high temperatures. The polyesters studied consisted of polymers of 1,1-dichloro-2,2-di(p-carboxyphenyl)ethylene dichloroanhydrides formed by high temperature condensation with dian, tetrachlorodian, dioxydiphenylsulfone, phenolphthalein or with bromophenolphthalein. The glass transition temperature of the dian polyester was greater than 483°K, while derivatives with the chlorinated or brominated bisphenols were even greater by 42 to 117°K. Films and coatings prepared from these polymers were nonflammable, and judged for use at temperatures of 473°K and higher. References 2 (Russian). [362-12172]

ADVANCES IN PREPARATION OF POLYMERIC MATERIALS WITH REDUCED COMBUSTIBILITY

Moscow PLASTICHESKIYE MASSY in Russian No 7, 1985 pp 25-29

NOVIKOV, S. N., OKSENT'YEVICH, L. A., NELYUBIN, B. V. and PRAVEDNIKOV, A. N.

[Abstract] A review is provided of essentially Western literature on the preparation of various polymers with reduced combustibility, encompassing polyolefins, polystyrenes, polyesters, aliphatic polyamides and polyurethanes. Special consideration is given to the discussion of individual flame-retarding agents, and their suitability and effectiveness in combination with the different polymers. Among the retardants covered are various inorganic salts, chlorinated organic compounds, and organic phosphonates and some phosphates. Special attention in the review is accorded to the newer developments in polyvinyl chloride and epoxide resin chemistry, as well as the polyolefins. References 66: 11 Russian, 55 Western.
[362-12172]

POURING CHARACTERISTICS OF LOW PRESSURE EPOXIDE MOLDING COMPOSITIONS
HARDENED WITH AMINES

Moscow PLASTICHESKIYE MASSY in Russian No 7, 1985 pp 31-33

KVASOVA, N. I., VOLOSHKIN, A. F. and VORONIN, A. A.

[Abstract] Fluidity was assessed as a pouring characteristic of low pressure molding composites hardened by various amines, using a line of promising epoxide resins hardened by single or combined amines. The fluidity determinations showed that maximum flow values were obtained with epoxide-dian resin ED-8, ED8 + epoxide-furan UP-63 melt and epoxide + novolac UP-643 resin hardened with 4,4-diaminodiphenylsulfone (I) or dicyandiamide (II), or with the amine combinations II + 4,4-diaminodiphenylmethane (III), or III + II. Maximum retention of fluidity was exhibited by UP-643 and ED-8 - based melts when hardened by I (more than 24 months) or II (ca. 13 months). The findings indicate that Ed-8 and UP-643 based resins hardened by selected amines and their combinations have the characteristics of useful low pressure molding composites and possess adequate shelflife. Figures 2; references 3: 2 Russian, 1 Western.
[362-12172]

RHEOLOGIC CHARACTERISTICS OF FOAM THERMOPLASTIC EXTRUSION PRODUCTS

Moscow PLASTICHESKIYE MASSY in Russian No 7, 1985 pp 33-35

NIKOLAYEVA, N. Ye., SABSAY, O. Yu., MALKIN, A. Ya. and FRIDMAN, M. L.

[Abstract] A mathematical analysis was conducted on the rheologic characteristics of foam polyethylenes, using commercial low and high density Lupolen (BASF, West Germany), prepared by treatment with azodi-carbonamide as the blowing agent. The rheologic parameters were analyzed to determine optimum conditions for the preparation of polyethylenes suitable for the manufacture of extrusion products. Analysis was conducted in terms of the dependence of the specific viscosity of the foam polyethylenes on the gas volume in the sample, which in turn is dependent on the temperature, geometric characteristics of the extrusion channel, and the molecular weight and structure of the polymer. The essential equations dealt with determination of the critical pressure at which gas is lost from the melt during processing and the system becomes biphasic. Determination of the critical pressure involved Henry's equation, $S = H p_{cr}$, where S = solubility of gas in melt, H = Henry's gas-law constant, and p_{cr} = critical pressure, and the relationship $S = cG/(100 - c)$, where G = gas number of blowing agent and c = gas concentration. At $S > cG/(100 - c)$ the gas is completely soluble in the melt, whereas at $S < cG/(100 - c)$ the melt begins to lose the gas and becomes unsuitable for extrusion processing. Figures 3; references 11: 5 Russian, 6 Western.

[362-12172]

ELECTROCONTACT FORMATION OF LAMELLAR PLASTICS FROM POLYPROPYLENE WITH CARBON FILLER

Moscow PLASTICHESKIYE MASSY in Russian No 7, 1985 pp 35-36

MOLCHANOV, B. I., BELOYAROVA, Yu. I. and KOTOMIN, S. V..

[Abstract] Since polypropylene sheets lack the strength and rigidity for many applications, studies were conducted on the use of an electrocontact approach to the preparation of carbon-reinforced polypropylene lamellae. Cursory technical information is presented on using the conductive characteristics of carbon fibers positioned next to the polypropylene sheet (200 mm x 50 mm x 2 mm) to heat the polymer and imbibe the carbon fibers. The advantages of this approach are that only the surface of the thermoplastic that is next to the carbon is melted at temperatures of ca. 220°C to allow adhesion. The electrocontact method was found effective in producing carbon-filled polypropylene with characteristics suitable for service as spouts for dip tanks in viscose fiber production. Figures 2.

[362-12172]

UDC 678.5-416:620.18

PHYSICOCHEMICAL ASPECTS OF STRUCTURAL CAPSULE FORMATIONS IN POLYMERIC FILMS

Moscow PLASTICHESKIYE MASSY in Russian No 7, 1985 pp 40-42

KONDRATOV, A. P., GROMOV, A. N., KLENDO, Ye. M. and MANIN, V. N.

[Abstract] Polyfluoroethylene F-3 (Kel-F), F-3M and F-32M films 100 μ m thick, were used to study the physicochemical aspects of structural capsule formation on uniaxial stretching in n-heptane at a rate of 0.33 sec⁻¹. Determination of the various physicochemical parameters demonstrated that maximum encapsulation is favored when maximum deformation approaches 350-400%, and the temperature is between the boiling point of the solvent and 40-50°C above the glass transition temperature of the polymers. Glycerol, because of its high heat capacity and incompatibility with the hydrocarbon solvent, favored the capture and retention of a large volume of the solvent in the capsules. Effectiveness of encapsulation was also increased by the addition of 10-50% surfactant (e.g., polymethylsiloxane). Figures 3; references 6 (Russian).
[362-I2172]

UDC 678.643'42'5.043:547.495.2

SUBSTITUTED BISUREAS AS LATENT HARDENING AGENTS AND HARDENING ACCELERATORS OF EPOXY RESINS

Moscow PLASTICHESKIYE MASSY in Russian No 7, 1985 pp 43-45

POPOV, L. K., LEUS, Z. G., PLYASHECHNIK, N. I., SITKIN, A. I.,
BATIZAT, V. P., PLOTNIKOVA, A. V., KOVALEVA, N. M. and ZAYTSEVA, N. P.

[Abstract] Seven substituted bisureas were tested for their activity as hardening agents for epoxy resin ED-20, and shown to be effective in concentrations of 6-10%. Hardening commenced at 108-110°C, with maximum rates of hardening seen at 130-200°C. The bisureas were also demonstrated to function as accelerators of hardening induced by carboxylic acids, their anhydrides, and dicyandiamide. Addition of 3% 4,4-bis(N,N-dimethylureido)-diphenylmethane (I) or a mixture of 2,4- and 2,6-bis(N,N-dimethylureido)-toluenes to 6% dicyandiamide resulted in a reduction in the hardening temperature for ED-20 from 175°C to 110°C. In addition, I was also useful in the synthesis of epoxide adhesives with shelflife exceeding 1 month. References 6: 4 Russian, 2 Western.
[362-12172]

ANTIFRICTION PROPERTIES OF COMPOSITE MATERIALS, REINFORCED WITH PAN-FIBERS

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 85 pp 8-10

ARTEMENKO, S. Ye., LYUTOV, V. A., NIKULINA, L. P., OVCHINNIKOVA, G. P. and MARKELOV, N. A.

[Abstract] Polyamides find limited use as antifriction materials owing to their high hygroscopicity, dimensional instability, low hardness and high coefficient of thermal expansion. These deficiencies may be overcome by using composite materials reinforced with chemical fibers. A study was made of the antifriction properties of an aniline-phenolformaldehyde resin and nitron fiber composite (40:60 ratio, by wt) formed at $150 \pm 3^\circ\text{C}$ and 100 ± 5 MPa pressure at 3 min/mm. Acetylene black, graphite and molybdenum disulfide were added as antifriction components and then applied to nonwoven polyacrylonitrile (PAN) fibers. The material was shaped into bearing sleeves and tested under the same conditions as conventional metal-fluorocarbon sleeves. The results show that sleeves made of the composite material have the same properties (coefficient of friction, hardness) as the more costly conventional sleeves. References 5 (Russian). [300-12765]

DIFFUSION OF ACIDS INTO POLYMERIC MATERIAL BASED ON EPOXY RESINS, MODIFIED WITH RUBBER

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 85 pp 10-11

GOLOVIN, V. A., EMEL'YANOV, Yu. V. and ILIN, A. B.

[Abstract] Corrosion-resistant materials based on epoxy resins and used to coat inner surfaces of chemical equipment, are multi-component systems where the components (as many as 6) may interact with one another, so that the ratio, order and conditions affect the chemical structure of the resulting crosslinked polymer. Varying just one factor at a time gives unreliable results and a multi-factor experimental approach must be used. A four-factor quadratic approach was used to study four levels of acid corrosion as varied against four other factors (corrosion medium, rubber type, rubber content, graphite content). This made it possible to statistically determine the effects of various recipe factors on the chemical stability of epoxy-phenolformaldehyde resins. Coatings modified with isobutylene oligomer and containing a high quantity of graphite had optimum properties. References 6 (Russian). [300-12765]

PHYSICAL-CHEMICAL CHARACTERISTICS OF IRON-CONTAINING POLYACRYLIC ACID

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 85 pp 11-12

ANNENKOVA, V. Z., ANNENKOVA, V. M., UGRYUMOVA, G. S., YEGOSHIN, V. A.,
ODINTSOV, V. V., ANDREYEVA, N. I. and VORONKOV, M. G.

[Abstract] A single-stage process was developed for producing iron-containing polyacrylic acid in aqueous medium at 25°-40°C in the presence of a redox system consisting of Mohr's salt + potassium persulfate in 1 : (8-12) mole ratio. The yellowish-brown polymer is soluble in water and odorless. A 1% aqueous solution of the polymer is a blood coagulant and is authorized for such use under the name "Feracyl". Aqueous solutions of the polymer (PK-2) may also be produced from acrylic acid production wastes and used for quenching baths, being superior to oil since they are non-toxic and fire-proof. Producing PK-2 polymer by this method at a machine building enterprise results in a 7-8 fold cost reduction for the iron-containing polymer. Figure 1; references 5: 4 Russian, 1 Western.
[300-12765]

REGULATING CELL STRUCTURE IN ELASTIC POLYURETHANE FOAM

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 85 pp 12-13

DUBYAGA, Ye. G., TITAROVA, G. I. and TARAKANOV, O. G.

[Abstract] Median cell size in elastic polyurethane foam (PPU) can be regulated by using a mixture of surfactants (foam stabilizer and foam quencher) during the foam forming stage. Cell size is enlarged by increasing the amount of foam quencher in the mixture. Cell size alteration can then be used to vary the physical and mechanical properties of the foam. References 5: 1 Russian, 4 Western.
[300-12765]

LONGEVITY OF ANTISTATIC MATERIALS BASED ON PVC

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 85 pp 15-16

SHEVERDYAYEV, O. N.

[Abstract] The time during which a polymeric material retains its anti-static properties is an important characteristic governing the applications range of the polymer. Loss of antistatic capability is due to loss of anti-static agent at the surface, diffusion through the bulk and chemical reactions of the agent with other substances. A formula was derived by which it is possible to determine the longevity of the antistatic capability of a material. This formula was used to calculate the longevity of a PVC floor covering (14 years). References 3: 1 Russian, 2 Western.
[300-12765]

EFFECTIVENESS OF METHODS OF MODIFYING CARBON FIBER MATERIALS

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 85 pp 19-21

NOVIKOVA, O. A., SERGEYEV, V. P. and LITVINOV, V. F.

[Abstract] A comparison was made of the effectiveness of several methods of modifying carbon fiber fabrics using resistance to delamination as a criterion. Thermooxidation, graft copolymerization with ethylene glycol and benzylic alcohol, hydroxylation and dressing with polyoxypropylene triamine (TA-50) all improved the wetting of carbon fiber (UUT-2) fabric. This is due to formation of polar groups at the carbon fiber interface in the cases of dressing and grafting, and activation of the carbon fibers with thermooxidation. The force required to tear the carbon fiber from the fabric after grafting with ethylene glycol and benzylic alcohol increased 1.5 times. Adhesion of the matrix to the carbon fiber increased the most after dressing with laprol. Hydroxylation was less effective than either thermooxidation or dressing in respect to wettability and adhesion. Most effective was a combined method of oxidation of the carbon fiber surface and application of an elastic oligomer having reactive terminal groups on the activated carbon surface. Figures 2; references 12: 6 Russian, 6 Western.
[300-12765]

EFFECT OF DEFECTS IN NON-POROUS POLYMERIC PVTMS MEMBRANE ON CHARACTERISTICS OF GAS SEPARATION PROCESS IN MEMBRANE APPARATUS

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 85 pp 21-23

PETROV, Ye. A. and GLADKOV, V. S.

[Abstract] Anisotropic membrane made of polyvinyltrimethyl silane (PVTMS) is used in gas enrichment apparatus in the chemical industry, medicine, agriculture and other fields. Both porous and non-porous membranes are known to have defects consisting of fine fissures, pores and ducts; the probability of these defects passing right through the membrane increases with decreasing thickness of the membrane. In a gas separation apparatus, some of the initial gas permeating the membrane passes through the non-defective portion of the membrane by an activated diffusion mechanism, and some through the defective openings by convection. In the present work, a study was made of the effect of this convection stream on the parameters of a binary gas separation process. A mathematical model was developed by means of which it is possible to calculate the component content in the output stream of a PVTMS gas separation apparatus, taking into account the defectiveness of a selective membrane. Figure 1; references 12 (Russian). [300-12765]

UDC 678.766.01:539

STRUCTURE AND PROPERTIES OF GEL-FORM POLYMERS

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 85 pp 23-24

KSENOFONTOV, B. S. and KULESHOV, V. I.

[Abstract] Gel-form polymers such as polyacrylamide (PAAG) are used to thicken suspensions, treat wastes, reinforce soil and separate biopolymers, particularly protein macromolecules. Structural uniformity of these polymers is known to be affected by physical interaction on the reaction mix prior to their synthesis. NMR, gas chromatography and IR-spectra were used previously to study the effects of preliminary treatment of the reaction mix with a non-uniform electrical field on the structure of the polymer gel. In the present work, proton relaxation time in PAAG was measured at 90 MHz with an impulse relaxometer. The results show that preliminary treatment of the reaction mix gives a more uniformly structured gel than without the treatment. Figures 2; references 5 (Russian). [300-12765]

HARDENING POLYMERIC COMPOSITIONS IN PRODUCTION OF ELECTRONIC COMPONENTS

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 85 pp 24-26

IVANOV, G. M., NESCHASTNOVA, L. M., VINOGRADOV, V. V., SHIRYAYEVA, G. V.
and PRISHCHEPA, N. D.

[Abstract] To evaluate the effectiveness of radiation hardening of polymerid composite materials to be used for electronic components and sealants, comparative studies were made of thermal, radiation-thermal and radiation hardening of resistor composites based on cresol-formaldehyde, epoxy and phenoxyphenylenemethylene thermosetting resins and composites based on the radiation hardening oligomers MGF-9 and OKM-2. The resistor films were made by applying a carbon-containing paste of the composition to a glass-textolite substrate by grid-stencil printing. After drying for 20 minutes at 120°C, the composites were subjected to thermal and electron-radiation treatment. It was found that addition of 3% polyethylenepolyamide and 2% diethylaminoethylmethacrylate to MGF-9 and MAED-30 epoxy oligomers as catalyst increased the degree of hardening and lowered the required radiation dosage. Radiation hardening of polymeric compositions thus appears to be a promising method for producing electronic components. Figures 3; references 6 (Russian).

[300-12765]

STRENGTH OF MECHANICAL JOINTS OF PARTS RIVETED WITH FILLED THERMOPLASTICS

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 85 pp 31-32

SHISHKIN, V. A., NOVIKOV, V. A., KABESHOV, V. T., SHPAK, O. L.,
SHCHERBAKOV, V. T., RYBKINA, Ye. G. and MAVLYANOVA, T. D.

[Abstract] Using plastic in place of metal rivets results in mechanical joints having less weight, higher corrosion resistance and no electric current carrying capacity. A study was made of the effectiveness of using filled thermo-setting plastic rivets. Breaking strength, shear stress, crushing strength and specific strength measurements were made on eight different type joints of D16 dural sheets. The rivets were made of a matrix of polyamide-6 and a filler consisting of phenylon (PAP-SVM), glass (PAP-S) and carbon fibers (PAP-U). The rivet heads were formed by heating to 235°C with a special tool and applying 6-8 MPa pressure with the same tool for 5 sec. The results show that joints made with plastic rivets are equivalent to those of light metal alloy rivets in resistance to shear stress with much less weight and it is therefore desirable to use plastic rivets on straight-cup lap joints. References 3 (Russian).

[300-12765]

HEAT-RESISTANT ANTICORROSION PROTECTIVE FILM BASED ON RADIATION-MODIFIED POLYETHYLENE

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 85 pp 32-33

LESHCHENKO, S. S., CHEBANYUK, S. A., MARGOLIN, D. M., TEREKHOV, V. D., PASKVITOVSKAYA, S. Ye., AGAFONOV, V. V. and NIZYEV, V. G.

[Abstract] Corrosion-resistant polyethylene insulating tape for natural gas pipelines is good for long-term use only at temperatures below 50-60°C. Three heat and light resistant radiation-treated polyethylene compositions, developed for water pipeline use, were tested for long-term service (two-years) at temperatures to 200°C. Phenolic additives and sulfur with carbon compositions inhibit radiation crosslinking. Elasticity changed significantly with temperature, viz., after 500-600 hours at 120°C, non-stabilized irradiated samples lost their elasticity and became brittle, while the stabilized irradiated samples fully retained this property after one year. Maximum stability was observed with Composition No. 4, withstanding 150°C for 3000 hours. Atmospheric testing for two years thus shows that radiation treatment of non-stabilized polyethylene film lowers its weather-resistance 2-3 times, while adding additives such as DG-100 carbon black, inhibits atmospheric ageing. References 7 (Russian).

[300-12765]

USING BLACK POLYETHYLENE FILM IN AGRICULTURE UNDER HUMID SUBTROPICAL CONDITIONS

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 85 pp 45-46

KOZMENKO, N. P. and NURMIYEVA, S. S.

[Abstract] Recently developed, black, two-layered, foamed film on a polyethylene base was tested for physical-mechanical characteristics under the humid, subtropical climatic conditions of Black Sea coastal Caucasia. Tensile strength tests after ageing under GOST 10171-71 show that the foamed film is not as strong as the non-foamed, carbon-filled polyethylene film, and that ageing is faster if the foamed surface is uppermost. Low mechanical strength and loss of elasticity preclude using the foamed film for more than 6-9 months per year. Advantages of the foamed film include low weight and better thermal properties. To improve air exchange, the Institute of Mountain Orchards and Flower Culture (at Sochi) developed a device for perforating the film to preset openings in the field. References 2 (Russian).

[300-12765]

IMPERMEABLE FILMS FOR HYDROMELIORATIVE USE

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 85 pp 46-47

KARLIVAN, V. P., ZITSAN, Ya. Ya., MOROZ, S. I., BLUDIN'SH, U. F. and
SAFRONOVA, R. F.

[Abstract] A study was made of the effects of composition on the properties of polyvinylchloride (PVC) + chlorinated polyethylene (CPE) sheet or film intended for hydromeliorative application. PVC grade E6250-Zh and CPE containing 36% chlorine were made up into three compositions containing varying amounts of plasticizer, vulcanizer and stabilizers. As the amount of CPE was increased from 20 to 80 parts by weight, tensile strength decreased from 25 to 6 MPa, while relative elongation to rupture increased from 40 to 780%. Frost resistance increased from 273K to 221K. After 2000 hours of exposure to UV-radiation, the properties of compositions stabilized with Ba, Cd and Zn salts were almost unchanged and conformed to requirements for hydromeliorative construction. This material is therefore recommended for use as a water-impermeable shield without protective ground cover. Figure 1; references 5: 4 Russian, 1 Western.
[300-12765]

POLYMERIC SOLID LUBRICANT AND PROTECTIVE MATERIAL FOR ROLLER BEARINGS

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 85 p 48

GLODIN, Yu. N. and ELISEYENKO, A. G.

[Abstract] A study was made of the possibility of using plastics as solid lubricants and protective material for serially produced roller bearings. The interstitial space of radial, single-gang, type 204 bearings made of ordinary bearing steel were filled with AFZ-3 material containing graphite and a thermosetting binder. Functional tests carried out at 8200 rpm and 500 N radial load for 752 hrs were increased to 750 N (27 hrs) and 1000 N (2 hrs and 45 min). The results show that the increases in tolerances due to wear are acceptable. Thus, the estimated longevity of type 204 bearing without AFZ-3 is 76 hrs, while that of a bearing with AFZ-3 was worked for 94 hrs. The rollers had a coefficient of rotary resistance of less than 0.01, thus giving the bearing a high antifriction characteristic. Filling the bearings with thermoplastic polymer also significantly simplifies the technology of producing them. Figure 1; references 4 (Russian).
[300-12765]

USE OF HEAT-RESISTANT ADHESIVE GIPK-11-10 IN MACHINE BUILDING

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 85 pp 48-49

AKOPYAN, O. I., KIRAKOSYAN, Kh. A., KROYAN, S. A., CHAKHOYAN, P. A. and MOVSISYAN, G. V.

[Abstract] Tests show that GIPK-11-10, an adhesive based on resorcinfurfurol and epoxysilicon-organic resins containing additives to improve heat resistance and elasticity, can be successfully used to join automotive brake shoes to backing plates. Comparison of data on strength factors after 2 hours at 200°C of this adhesive with that of VS-10T, a modified phenolic resin adhesive currently used for brake shoes, shows that the new adhesive is greatly superior. Reference 1 (Russian). [300-12765]

CHEMICAL RESISTANCE OF POLYETHYLENE FILM TO KMnO_4

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 85 pp 50-51

NIKITENKO, A. Z. and IVANOVA, G. V.

[Abstract] Chemical substances are currently stored in polystyrene and polyurethane containers owing to the low cost and excellent moisture and heat insulating properties of these substances. A study was made of the possibility of substituting steel-3 with polyethylene film grades 15803-02 and 153-901 for packaging potassium permanganate. Packets were formed from 0.1 X 200 X 200 mm strips of polyethylene, loaded with potassium permanganate and stored at 20°C for one and six months. Breaking strength and relative elongation data show that losses do not exceed 20% and that the above grades of polyethylene film are suitable as packaging material for potassium permanganate. References 3 (Russian). [300-12765]

STRUCTURAL EFFECTS OF THICKNESS ON MICROPOROUS COPOLYAMIDE MEMBRANES

Minsk DOKLADY AKADEMII NAUK BSSR in Russian Vol 29, No 7, Jul 85
(manuscript received 22 Oct 84) pp 615-617

MOSTOVLYANSKIY, O. A., CHEKHOVICH, L. P., ARTAMONOV, V. A. and
SOLDATOV, V. S., academician, Institute of Physical Organic Chemistry,
Belorussian SSR Academy of Sciences

[Abstract] The structural effects of membrane thickness on permeability characteristics of microporous copolyamide PA-6/66-4 membrane were evaluated. The factors under analysis included measurements of flow rate, pore size, thickness of surface and lining layers, and effective porosity, as well as electron microscopy. Hydraulic pore radius was seen to increase in the 45-140 μm thickness range, and remained constant thereafter. However, at ca. 140 μm , effective porosity decreased, while total pore density remained relatively unaltered. Electron microscopy revealed structural differences between the superficial and bottom layers of the membrane, the latter adhering to the support matrix. With an increase in overall membrane thickness effective porosity showed a concomitant increase in the case of the upper layer. In the case of the bottom layer effective porosity decreased at ca. 180 μm , and drastically so at 225 μm , and greater, thicknesses. These observations were interpreted on the basis of different stretch forces acting on the unattached or freely-movable upper layers, and the bottom layers of the membrane 'fixed' to the carrier. Figures 2; references 5: 4 Russian, 1 Western.
[330-12172]

THERMAL CHANGES IN POLYMETAPHENYLENEISOPHTHALAMIDE REINFORCED WITH IRON-CONTAINING CARBON FIBERS

Minsk DOKLADY AKADEMII NAUK BSSR in Russian Vol 29, No 7, Jul 85
(manuscript received 3 Aug 84) pp 618-621

YERMOLENKO, I. N., academician, Belorussian SSR Academy of Sciences,
DUBKOVA, V. I., BURYA, A. I. and BEDIN, A. S., Institute of General and
Inorganic Chemistry, Belorussian SSR Academy of Sciences; Dnepropetrovsk
Agricultural Institute

[Abstract] IR spectroscopy and thermal analysis were used to monitor heat-induced decomposition of polymetaphenyleneisophthalamide (I) reinforced with Fe-bearing carbon fibers, covering a temperature range of 200-550°C. Reinforced and unreinforced samples of I were similarly resistant to heat treatment at 200°C or below. However, at higher temperatures more rapid destruction of I occurred due to the catalytic properties of the Fe-carbon

fiber in accelerating oxidative decomposition. The data thus indicate that the use of Fe-carbon fiber reinforced I should be limited to a maximum temperature of 200°C to prevent part failure. Figures 1; references 9 (Russian).
[330-12172]

UDC 547.233.4+678.046.83.744.335

EFFECTS OF UNSATURATED-RADICAL QUATERNARY AMMONIUM SALTS ON
METHYLMETHACRYLATE POLYMERIZATION AND COPOLYMERIZATION WITH STYRENE

Minsk DOKLADY AKADEMII NAUK BSSR in Russian Vol 29, No 7, Jul 85
(manuscript received 6 Mar 84) pp 622-625

KHAZRYATOVA, L. Kh., KUZNETSOV, Ye. V., SERZHANINA, V. A.,
KACHEROVSKAYA, F. B., BIKMULLINA, L. A., MIKHALEVSKAYA, S. V.,
KUSHKOVA, T. M., GERASIMOVA, S. S., VASILENOK, Yu. I. and LAGUNOVA, V. N.,
Institute of Physical Organic Chemistry, Belorussian SSR Academy of
Sciences; Kazan Institute of Chemical Technology imeni S. M. Kirov;
"Plastpolimer" Scientific Industrial Association, Leningrad

[Abstract] An analysis was conducted on the kinetics and yields of anti-static polymers and copolymers in relation to the addition of allyl radical quaternary ammonium salts to the radical polymerization reaction. Studies with the polymerization of methylmethacrylate (I) and methylmethacrylate-styrene (II) copolymers demonstrated that increasing concentrations of I accelerate the reaction and yield of the polymer and copolymer, while inclusion of the antistatics decreased the rate of polymerization or copolymerization, the molecular weight of the final product, and the yield. Determinations of the energies of activation demonstrated that dimethylallyl(carboxymethylacetyl) ammonium chloride increased the energy of activation of I polymerization from ca. 70 to ca. 86 kJ/mole, and of the copolymerization II reaction from ca. 64 to ca. 78 kJ/mole. Figures 2; references 5: 1 Belorussian, 1 Russian, 3 Western.
[330-12172]

CHEMICAL STABILITY OF RADIATION-TREATED POLYETHYLENE TUBING EXPOSED TO WOOD
CHEMISTRY REAGENTS

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST in Russian No 5,
1985 pp 15-16

ZOTOVA, L. M., senior scientist, KURILOVA, senior engineer, MIKHALYUK, G. F.,
laboratory chief, DANILOV*, V. G., senior scientist, and MAMISTOVA*, O. V.,
junior scientist, Central Scientific Research Wood Chemistry Laboratory
*"PLASTIK" Scientific Industrial Association

[Abstract] Studies were conducted on the stability of radiation-treated polyethylene tubing to reagents commonly encountered in the wood chemistry industry, with a view toward replacement of costly steel tubing with low- and high-density polyethylene products. The trials consisted of exposure of the plastic tubing to the reagents (acetic acid, ether acid, black vitriol, acid water, etc.) for 500 h at 100°C, with subsequent mechanophysical analysis. The data showed that the polyethylene tubing could be used for acetic acid and ethyl acetate, and the appropriate recommendations were prepared. The tubing was damaged by black vitriol, but tubing filled with up to 25% carbon was not adversely affected.
[366-12172]

RUBBER AND ELASTOMERS

UDC 678.746.22.074:620.178.7

EFFECTS OF ELASTOMER TYPE ON SHOCK-RESISTANT POLYSTYRENE SYNTHESIZED BY ANIONIC POLYMERIZATION

Moscow PLASTICHESKIYE MASSY in Russian No 7, 1985 pp 14-16

GARSHIN, A. P., and GLUKHOVSKIY, V. S.

[Abstract] Determinations were made of the physical and mechanical characteristics of shock-resistant polystyrene produced by anionic polymerization in the presence of linear and branched elastomers. The results presented in tabulated and graphical forms for linear (PB, B + S) and branched specimens $((B + S)_4Si$ and $(S + B)_4Si$), where B = butadiene polymer and S = styrene polymer, demonstrate that superior properties were exhibited by unstructured block-copolymers of the $(S + B)_4Si$ and $(B + S + B)_4Si$ type. Greater stability and elasticity was shown, by the elastomeric phase, to high-temperature and shock challenge when the molecular weight of the polystyrene block was kept low (less than 20,000). Thus, changes in the properties of shock-resistant polystyrene induced by pressure molding or extrusion are largely dependent on the type of block copolymer employed. Figures 2; references 7: 4 Russian, 3 Western.
[362-12172]

UDC 678.664-405.8:533.612

PROPERTIES OF ELASTIC POLYURETHANE FOAMS FILLED WITH KAOLIN

Moscow PLASTICHESKIYE MASSY in Russian No 7, 1985 pp 30-31

KOPSHEVA, L. M., SHAMOV, I. V. and TARAKANOV, O. G.

[Abstract] An evaluation was conducted on the effects of quaternary ammonium surfactant (Alkamon DS)-treated and untreated kaolin on the properties of polyurethane foams. Introduction of untreated kaolin raised the pH of the polyurethane from 5.85 to 6.15 with 10% kaolin, and to 6.70 with 20% kaolin. The respective increases in pH with treated kaolin were to pH 6.6 and 7.2. The mechanical properties of polyurethane filled with

the treated kaolin were inferior to those treated with the surfactant-untreated kaolin and, in view of the particle size similarity of the two kaolin batches, the difference was ascribed to the difference in the degree of dispersion of the two kaolins. The decrease in the surface area of the surfactant-treated kaolin particles led to poorer adhesion to the polyurethane moieties and lower dispersion, as indicated by the accelerated sedimentation kinetics of treated kaolin. Figures 1; references 8: 7 Russian, 1 Western.
[362-12172]

WATER TREATMENT

UDC 678.067.5:628.543.081.32

TREATMENT OF WASTE WATERS FROM PLANTS FABRICATING GLASS-REINFORCED PLASTICS

Moscow PLASTICHESKIYE MASSY in Russian No 7, 1985 pp 50-52

SOSNOVSKAYA, A. A., PETRYAYEV, Ye. P. and YEDIMECHEVA, I. P.

[Abstract] Several kinds of activated charcoal (BAU, AG-3, SKT, KAD-iodine, AGN, AR-3, OU-A-alkaline) were tested for their suitability to purify waste water from plants fabricating glass-reinforced plastics. Such waste waters are characterized by extremely high biochemical oxygen demand on the order of 3000 to 16000 mg O₂/liter, concentrations of suspended substances on the order of 5000 mg/liter, and a pH in the 10.5-11 range. Preliminary trials demonstrated charcoal AG-3 (1.5-2.5 mm granules) to be superior to the other activated charcoals in terms of cost effectiveness and adsorptivity. On the basis of the preliminary results, a treatment scheme was devised consisting of soda treatment, sedimentation, clarification, and removal of organic matter by AG-3. The latter is employed in a 1.5 m diameter filter with a 2 m AG-3 layer. The scheme devised results in the reduction of the biochemical oxygen demand of the treated water by 65-75% and removal of 99.7 to 99.9% of the suspended matter, with the utilization of 16.7 kg of AG-3 per one cubic meter of water. This method has been found to be twice as cost effective and four- to five-times as efficient as thermal polymerization in the treatment of waste effluents from such plants. Figures 2; references 5: 4 Russian, 1 Western.
[362-12172]

WASTE WATER TREATMENT AT AGROINDUSTRIAL COMPLEXES

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNIKA in Russian No 7, 1985 pp 4-5

YAKOVLEV, S. V., corresponding member, USSR Academy of Sciences, DEMIDOV, O. V. and SHVETSOV, V. N., candidates of technical sciences, All-Union Scientific Research Institute of Water Supply, Canalization, Hydrotechnical Construction and Engineering Hydrogeology

[Abstract] A summary review is provided of the projects undertaken at the Institute to provide water-treatment facilities at various agroindustrial

complexes in the USSR, as well as their cost effectiveness. Major projects dealt with the establishment of various biological treatment plants, taking into consideration the unique requirements of the local situation, i.e., whether pollution primarily involved chemical fertilizers, pesticides, herbicides, etc., or whether animal products, byproducts and wastes represented the pollutants. In general, specific schemes could reasonably be expected to reduce the biological oxygen demand of treated water by 70-80%, and eliminate color, and unsavory taste and smell.
[360-12172]

UDC 697.432

SCALE DEPOSITION IN HEATING BOILERS

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNIKA in Russian No 7, 1985 pp 20-21

KAMENETSKIY, B. Ya., candidate of technical sciences, Scientific Research Institute of Sanitary Technology

[Abstract] A mathematical analysis was conducted on CaCO_3 deposit buildups in heating boilers leading to boiler breakdown. In the case of two boilers under analysis, models GAZ-900 and Fakel, scale density reached 2000 kg/m^3 . On the basis of the numerical data an equation was derived relating the temperature drop across the deposit over time to scale density and heat conductivity, leading predictive values for boiler lifetime. The rate of scale formation can then be used as a criterion for preventive maintenance to extend boiler serviceability. Figures 3; references 5: 4 Russian, 1 Western.
[360-12172]

UDC 678.5.002.68:546.214

TREATING PHENOLIC SOLUTIONS WITH OZONE

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 85 pp 38-39

POPOVICH, Z. P., PEREVOZCHIKOVA, S. V. and NIFONTOVA, L. S. --

[Abstract] The currently used method of treating phenolic waste solutions with caustic soda is not entirely satisfactory owing to the large amounts of sodium hydroxide needed and the lack of steady consumers for the recycled solution. Research conducted on treating phenolic solutions with ozone, a readily available by-product which is itself an air pollutant, is sparse and contradictory. In the present work experiments were conducted in a laboratory-scale bubble reactor employing an electric ozonator and 40%

perchloric acid with 10 g/liter of sodium fluoride as electrolyte. An ozone-air mixture was bubbled through spent industrial de-phenolizing solutions. Three series of experiments with varying conditions and dosages of ozone showed that concentrated phenol solutions may be treated effectively with 0.12 - 0.18 mg ozone per mg of phenol. Figure 1; references 4: 3 Russian, 1 Western.
[300-12765]

UDC 676.004.69

NEW MACHINES IN PAPER, CARDBOARD AND CELLULOSE PRODUCTION

Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 8,
Aug 85 pp 4-7

ALMAKAYEV, D. A., ILINSKIY, M. V. and PESTRIKOV, V. M., engineers

[Abstract] Paper making and drying machines are among the most complicated in the paper-manufacturing industry, and are the determining factors in the overall productivity of a plant. In view of this, constant efforts are being made to construct more efficient machines and to upgrade existing facilities in order to more efficiently utilize available natural resources and meet the challenges of the 11th Five-Year Plan. As an example of advances in the construction and improvements made in the field, recourse can be had to the new B-15 paper-making machine. The high speed and volume of this equipment makes possible production of enough newspaper paper in a day to print nine million copies of PRAVDA. Soviet-made machines serve not only the Soviet market, but also are in high demand in the COMECON countries and in the developing parts of the world. The high degree of automation of paper, cardboard and cellulose production of these new machines renders the entire industry more cost effective and further contributes to progress in the entire field of technology. Figures 3.
[364-12172]

UDC 676.054.2.676.056.5

FILTRATION DRYING INSTALLATION FOR PAPER AND CARDBOARD

Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 8, Aug 85
pp 13-15

SEGAL, Ye. M. and LOTVINOV, M. D., engineers, and FEYGIN, V. B. and
BABINSKIY, V. A., candidates of technical sciences

[Abstract] The filtration approach to the drying of paper and cardboard products appears to be one of the more promising technologies for the production of high-porosity paper and millboard. Further refinements in this

technology were made on the basis of a B-46 paper-making machine, by using cylindrical vats for drying the pressed pulp. Drying was attained by the delivery of hot air (up to 250°C) and a pressure drop across the sample of up to 70 kPa. The machine for which technical details are provided resulted in a savings of 4,200 GJ of thermal energy and 34,500 kW·h of electricity per year, giving an annual cost effectiveness of 446,000 rubles. It is anticipated that further technical improvements in the system could raise the efficiency 1.5- to 2-fold. Figures 2; references 8 (Russian). [364-12172]

UDC 630+863.4:661.725.81

XYLITOL PRODUCTION WITH CRYSTALLINE XYLOSE BYPRODUCT

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST in Russian No 5, 1985 pp 10-11

LEBEDEV, N. V., SARZHE, V. I., KUZNETSOV, V. M. and SHUBIN*, A. P., All-Union Scientific Research Institute of Hydrolysis; *Yangi-Yul Biochemical Plant

[Abstract] A novel scheme has been devised for the production of xylitol, with intermediate production of crystalline xylose. The key features include the addition of acetic acid to the pentose hydrolysate after the inversion, neutralization, filtration and evaporation stages, followed by rectification on a vacuum column. Following distillation, xylose is crystallized from the 46-48% acetic acid syrup in 60-65% yields by lowering the temperature from 65 to 25°C at a rate of 4°C/h. At 40°C the solution is primed with 0.8-0.9% xylose crystals. The use of acetic acid requires chromium and nickel steel apparatus, and provisions for adequate ventilation to protect the workers. Figures 1; references 3 (Russian). [366-12172]

UDC 630*863.5:663.14.039.3

OPTIMIZATION OF SUPPLEMENTAL NON-NITROGENOUS MINERAL SUPPLEMENTS FOR LIPID-SYNTHESIZING YEASTS

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST in Russian No 5, 1985 pp 11-12

OLESHKO, V. S., candidate of biological sciences, and MAKOVNIK, M. N., engineer, Institute of Microbiology, Belorussian SSR Academy of Sciences

[Abstract] The effects of various salts on the growth and biosynthetic activity of *Lipomyces lipoferus* were analyzed to identify those media

components having the greatest physiological significance. Studies with KCl, KH_2PO_4 and MgSO_4 led to delineation of wood-pulp media supporting maximum growth and protein+lipid production. For *L. lipoferus*, optimum growth conditions were represented by hydrolysates supplemented with 0.12 g/liter KH_2PO_4 and 0.05 g/liter of MgSO_4 . References 4 (Russian).
[366-12172]

MISCELLANEOUS

UDC 541.8:539.19

ACOUSTIC EFFECTS IN CHEMICAL AND PHYSICOCHEMICAL PROCESSES

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 7, Jul 85
(manuscript received 19 May 83) pp 1792-1793

SMIRNOV, A. N. and DEMENTYEV, A. N., Moscow Higher Technical Secondary
School imeni N. E. Bauman

[Abstract] A new approach to the study of chemical and physical chemical phenomena is proposed, based on the measurement of acoustic emissions by piezoelectric sensors. Description is provided of recordings made from a number of chemical and physical chemical processes, including the formation of barium sulfate from sulfuric acid and barium chloride, dilution of sulfuric acid in water, and the melting of ice under different conditions. Useful signals were obtained in the frequency spectrum from 0.1 kHz to 1 MHz. The acoustic oscillations can also be detected by optical techniques by transmission of a helium-neon laser beam through a reaction cuvette and the use of a liquid interferometer. The optical method is sufficiently sensitive to detect the addition of one drop of ethanol to 300 ml of water. Figures 1; references 1 (Russian).
[356-12172]

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